The Electrical Review

VOL. CXI. NOVEMBER 25, 1932. No. 2870.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGLEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to E.R. (1930) LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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The Grid Tariff

A NOTABLE event this week has been the publication of the "Grid Tariff" for the Mid-East England Area, which is to come into operation in the New Year, thus putting the Central Electricity Board on to a trading basis.

This area of some 7,500 sq. miles includes the great industrial centres of Yorkshire and the contrasting rural districts of Lincolnshire; a population of over four and a half millions is served by nearly eighty undertakings. But the chief interest lies in the intimation that the general form of the tariff will be applicable nationally, although the precise monetary payments may vary from area to area in accordance with local conditions.

The Central Board in drawing up the tariff wisely took the supply industry into its confidence as represented by the National Consultative Committee, the formation of which would be justified if only for this piece of collaboration.

A study of the tariff indicates that its framers have kept well in their minds the vital quality of any tariff: that it should encourage the growth of load. This general feature is more essential to success than any detail. It is of especial importance under the new regime, as—apart from economies in generation—the cost of the grid is to be set off, very largely, against the release of standby plant for regular operation, and the ability to use such plant productively depends upon increase in output.

The method of progressively reducing the m.d. charges as the demand grows beyond this year's figure not only encourages an undertaking to develop, but also provides a most ingenious way of holding the difficult balance between large and small undertakings supplied under a common tariff. This arrangement, incidentally, holds out hope for the future to those concerns whose m.d. will be low this year due to local industrial conditions being especially severe.

It is the running charge that is of the greatest ultimate importance, and at 0.186d. per kWh, with coal at 13s. per ton, it should be possible to cater for loads requiring very low rates, especially as the kilowatt charges are not payable in the summer, or in respect of the earlier months of the year for large connections made towards the latter portion.

A class of consumer which may benefit from the provision that energy will be given (on terms) by the Board from more than one point is the distributor taking a bulk supply from a directly supplied undertaking, as in many cases substantial expenditure on the latter's transmission system can be avoided by this means.

It should be borne in mind that this is the grid tariff that will be quoted for the next ten years to undertakings which cannot obtain electricity more cheaply now. Those which can do better have their position secured under the 1926 Act. In any case, the explanatory note of the Board, the standard form of agreement, and the memorandum on metering will repay careful study.

The Long View

MR. W. B. WOODHOUSE, writing to a daily paper, points out that electricity and gas cannot be regarded as competitors of coal; these industries are large users of coal, and help it to combat its real menace—imported fuel oil. As he rightly says, attempts to protect the coal trade by price discrimination against the most convenient methods of distributing its product can only result in a further reduction in its use. By utilising coal in the electrical way we shall, owing to its greater convenience, undoubtedly raise the standard of the consumers' requirements. We have had plenty of experience in our own industry of how profitable it is to take the long view. Low tariffs have increased profits, and the use of more efficient lamps and fittings has enormously advanced the consumption. So has the education of the industrial consumer to making the best use of his apparatus. Low prices do

stimulate consumption, but they need not be cut to so low a figure if every opportunity is taken to reduce the energy consumption for every duty to the minimum possible.

To-night's Cooking Conference

THE importance of the subject of to-night's London Conference of E.D.A. should draw a good attendance. Two introductory papers—anonymous ones—are to be contributed, and the discussion, if free and frank and from the right people, should be one of the most profitable of this or any previous session. There will be expressed both a manufacturer's and a supply engineer's point of view, and we expect the manufacturer to have something to say on cooker standardisation—not the kind which "cramps the style" of any one concern, but that which will allow the full benefits of mass production to be realised. Perhaps something will also be heard of new and improved types. Cooker manufacturers should remember that by far their biggest competitor is the gas industry—indeed, it is the only serious competitor, largely by reason of the measure of standardisation which it has introduced.

Safety in Bed

IN the correspondence columns of the *British Medical Journal*, a doctor refers to the considerable benefit derived by patients from the use of electric heating pads. When used as bed-warmers, he says, there is a risk of the flex breaking down near the regulating switch and so causing a fire or, at least, frightening the patient. His suggestion is that the flex should be enclosed in a safety metal case up to well beyond the part which lies in the bed. This seems to us to be a cumbersome arrangement. Why not use tough-rubber leads or one of the various types of robustly insulated cable now on the market?

Still Making Headway

THE announcement of a new issue of ordinary shares by the North-Eastern Electric Supply Company once again gives prominence to the fact that this great undertaking continues to make progress at a gratifying pace. Down to date this year the new connections amount to 20,000 horse power, while orders for a further 27,665 horse power are in hand. The domestic load is still advancing, and the 18,625 additional consumers connected since last December exceed the addition during the whole of 1931. The aggregate consumption of energy is up, and the new capital that is being issued to existing holders will go towards meeting the cost of present expansion measures.

The Dog It Was . . .

A BOURNEMOUTH resident who, to scare away cats, installed a 230-V line in his garden has successfully resisted a claim in respect of a trespassing dog which was killed by electric shock. Presumably a wire-haired terrier, being an uninsulated dog, would be particularly prone to this sort of thing, but there is also danger to human beings in such an installation. The judge appeared to have misgivings as to the equity of his decision, suggesting that a higher court might alter it; and he also expressed the hope that there would be no attempt to copy the method. We heartily agree, for, whatever the legal aspect may be, a case of this kind is of questionable value as an advertisement for electricity.

The "Telex" Service

WE have often heard it asked whether the telephone does not waste more time than it saves! The true answer is, of course, that the telephone is an unequalled time saver, but the exasperation of busy men engaged on important and urgent work at inconvenient interruptions on relatively trivial points is understandable. Much more use might have been made of the telegraph for rapid communication when conversation was not essential. The "Telex" system will give the advantages of both the telephone and the telegraph at the office desk. Its introduction was described by Sir Thomas Purves at last week's I.E.E. meeting as the most sweeping change in telegraphy that had ever been made. The use of existing local telephone circuits making its installation simple, and no doubt the rental terms offered by the Post Office will be found a great boon.

The Future of the Railways

THE demonstrations of Diesel-electric locomotives in the North Country this week focuses attention again on the question of main-line electrification *versus* Diesel-electric traction, and each of these, in turn, *versus* steam traction. "Railway engineers love their steam engines," said Lt.-Col. P. D. Ionides at luncheon, and this probably reflects the attitude which will govern these problems for a long time ahead. Apart from the broader financial considerations, until track distribution or generation aboard can be brought to a clearer issue there will be no forsaking the old love. In the meantime the railway work will be rightly coveted by the Central Electricity Board, by the oil-engine makers, and by the electrical manufacturers from their respective points of view. But all must remember that it is with the railway companies that the final decision will rest.

All Things to All Men

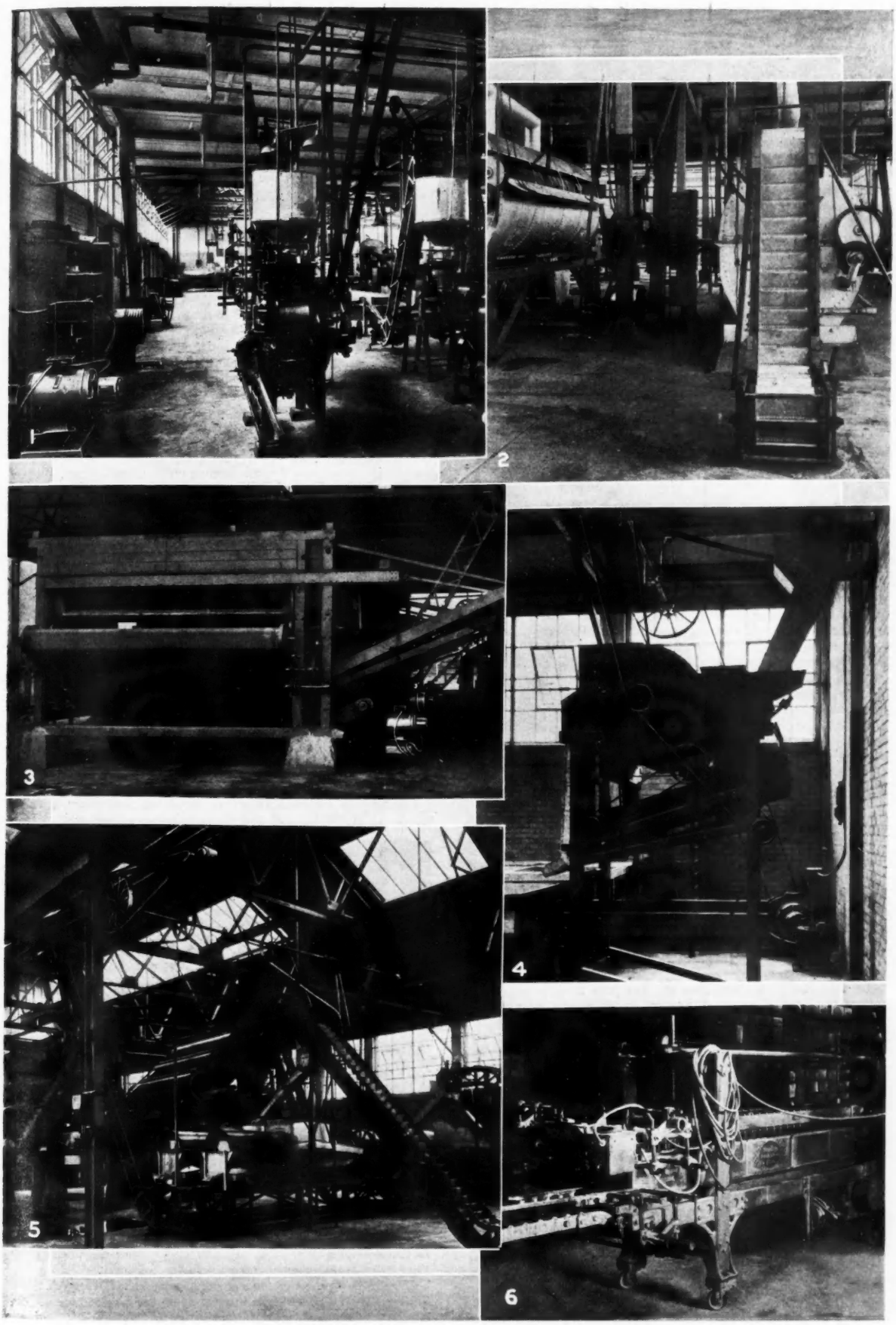
WE are asked to state that the Building Centre in New Bond Street is by no means confined to the architectural profession, but is also available for and is actually being considerably used by the public. The Centre has brought into co-operative effort 800 firms connected with the manufacture of materials for building, and is thought to be the "forerunner of similar centres for other industries." We think that the purpose of the Centre has been made perfectly plain to our readers, but whether its existence renders unnecessary a popular electrical demonstration on a big scale as part of an effort to impress the general public is quite another matter. E.D.A.—that is, the industry—has got to play to the pit as well as to the stalls—some of those we want to impress will queue up for the circus rather than book the best seats at the opera!

Wood Poles and Woodpeckers

DAMAGE to transmission poles by green woodpeckers is giving trouble to the S.W. & S. Power Co. Mr. J. T. H. Legge, the managing director, informs us that the birds attack heavily impregnated sound poles. To save the poles the company fills the holes with plastic bituminous compound mixed with tar, wrapping them for a foot on each side with puttees of three-inch wide bituminised tape treated overall with rubberoid solution. Experience only will show whether this is a better method than those adopted by the Post Office locally, which include the filling of the holes with Portland cement and covering them with metal sheets. The green woodpecker is rapidly increasing in numbers owing to recent protective legislation, and other undertakings may have similarly suffered. Communications regarding their experiences would be welcome.

Heat In The Hotel

IF British hotels are so dismal as to need a special E.D.A. campaign to enlighten them, what shall be said of their heating arrangements? Now that money is scarce their welcome may be genuine, but is it warm? As E.D.A. has decided that hotel heating provides another vast field for electrical enterprise we feel inclined to doubt it. In our experience a large number of hotel bedrooms are mortuary-like both in their appointments and their temperature; many others (usually the larger, more pretentious ones) maintain a hot-house atmosphere. The industry can give glad tidings to the proprietors of both kinds. The electric fire, with its separate control, can do away with the expense of central heating, and it can also be adapted (by means of a slot meter) to make guests pay for their own warmth if they want it.



Electric Driving in a Lincolnshire Fruit Cannery

1. A 25-h.p. motor for filling and capping machines. 2. A pair of blanching machines and a bucket conveyor with the driving motors in the centre. 3. One of the pea viners (discharge end) driven by a 25-h.p. slip-ring motor. 4. Another 25-h.p. drive—a pea-washing machine. 5. Cleaning and grading machines with an overhead drive from an 8-h.p. squirrel-cage motor. 6. The carton-sealing machine

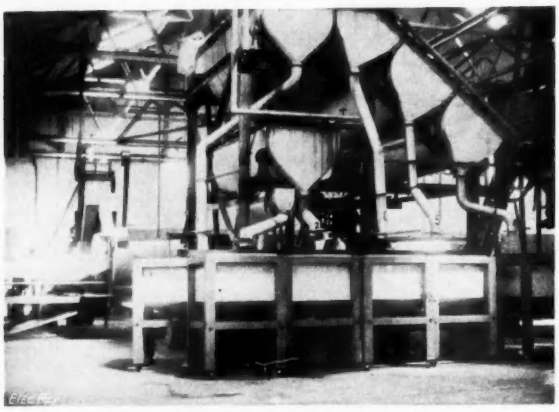
D

Fruit and Vegetable Canning

Processes and equipment in a Lincolnshire factory

A COMPARATIVELY new opening for electrical business in this country is fruit and vegetable canning, and the following description of the processes and equipment at the Spalding factory of Wisbech Produce Canners, Ltd., shows that the electric drive is the only practicable method.

The principle vegetable product of this factory is canned peas, and it will be sufficient to devote our attention to this, as for other vegetables the processes are very similar, and generally the same equipment is used. After being machine mowed the peas, complete with their vines, are conveyor fed to viners in which the peas are separated from the pods by a slight rolling or brushing operation by beaters carried on



The discharge end of one of the graders

paddles to the arms of which the vine clings. The pods split open and the peas fall through a rubber riddle, on which the pods are "squeezed," on to a travelling belt.

The waste vine is discharged at the other end of the machine on to a conveyor system from which it is carted away for manure. Bucket conveyors carry the peas into cleaners in which all light foreign matter, chiefly poppy heads, is removed in a strong air current created by a fan. The peas are next treated in washing machines in which further unwanted material is removed by water sprays.

The Grading Methods

The next process is grading on machines each with a series of six revolving drums, with perforations of different sizes through which the peas escape in sequence.

During the whole of these grading operations the vegetable is subjected to cold-water cleaning sprays. Collected from chutes at the ends of the grading cylinders, the peas are next delivered to revolving drums in which they are blanched (semi-cooked). The drums are immersed in steam-heated boiling water. A central "corkscrew" in each drum carries the peas from one end to the other in a time predetermined by a "Reeves" speed-regulating gear with limits representing one and twenty minutes.

In a machine like the blancher the peas are again washed before they fall through chutes on to inspection tables, each of which consists of an endless belt, presenting a top surface 2 ft. wide and 12 ft. long, on which they are subjected to the scrutiny of girls standing on either side. Ingenious filling machines are fed with peas from the inspection tables by cans moving under gravity from the stores above, and with brine or preserving liquor; the peas and liquor are delivered in their correct proportions through valves into the cans on a revolving table beneath. Capping is the next operation, involving a series of rolling operations on special machines at the edges of the caps and cans.

The filled cans, in crates, are lowered into large vertical retorts in which they are cooked at 240 deg. F. for half an hour or so, when they are removed, still in their crates, and are suspended from an overhead runway. Then they are passed through a canal of cooling water outside the building. The cans leave the canal sufficiently warm to dry themselves, when they are taken to the warehouse on a continuation of the runway which also returns empty crates to the factory.

Treatment of Fruit

Because the initial operations are performed by hand, fruit treatment involves much simpler general machine processes; indeed, the machine operations do not commence until the fruit is in the cans, which are carried by a belt conveyor running above and lengthwise with the sorting tables to filling machines in which they receive the necessary quantity of syrup. They are next treated in the exhaust box in which they travel on an endless belt through boiling water, the idea being to remove any cold air from the fruit and the cans.

Sealing, while hot, is done on capping machines similar to those used for the peas. The fruit is next cooked in apparatus like the pea blancher, and it is discharged thence immediately into a cooler before being conveyed to the warehouse.

Continuous "Line" Processes

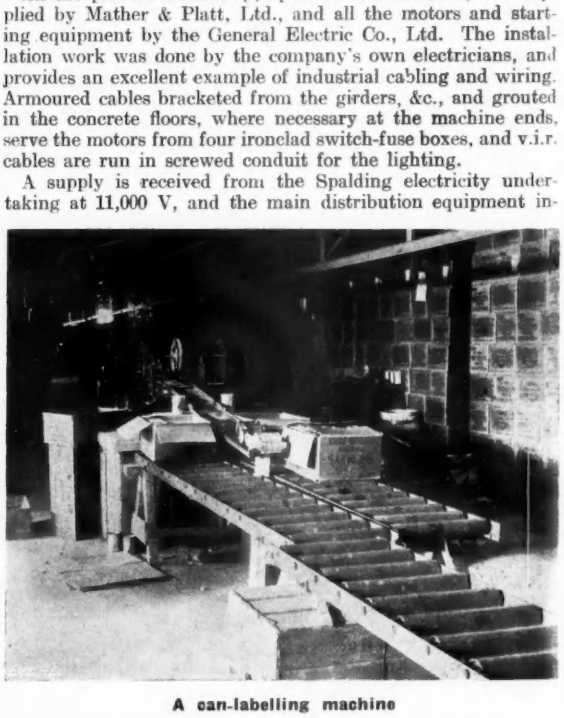
The foregoing notes have probably given the impression of continuous operations carried out on "lines" of machinery. Each vegetable line consists of three viners, two washers, one grader, one blancher, one washing machine, two inspection tables, two filling machines, two capping machines, and six retorts, and will deal with about forty-five acres of peas, representing about 55 tons per week of seventy hours.

A 25-h.p. motor drives each pair of viners, one 4-h.p. motor serves a pair of washers, an 8-h.p. motor drives each grader, there is a 6-h.p. drive for the blancher, and the washing machine, the picking tables and filling machines for two lines are driven by a 25-h.p. motor. A motor of similar size serves six capping machines, and a 6-h.p. motor is responsible for the conveyor system for the cooling canal, &c. Two 6-h.p. motors deal with a fruit line, one driving the picking table belt, the filling machine, and the exhaust box, and the other the capping machine, the continuous cooker, and cooler.

Auxiliary operations include labelling the cans and gumming down the flaps of cartons, as well as the driving of various elevators, conveyors, &c. A labelling machine supplied by the Beth Labelling Machine Co., Ltd., is driven by a 3-h.p. motor, and it will deal with 4,000 cans per hour. A carton-sealing machine in which the packages are passed between two sets of rolls is served by a 1-h.p. motor and will deal with up to 2,000 cartons per day (as fast as they can be hand fed). When a carton enters the machine it lifts a flap and thereby automatically switches the motor on, the switch remaining on until the flap is released at the other end of the box.

All the process machinery, apart from auxiliaries, was supplied by Mather & Platt, Ltd., and all the motors and starting equipment by the General Electric Co., Ltd. The installation work was done by the company's own electricians, and provides an excellent example of industrial cabling and wiring. Armoured cables bracketed from the girders, &c., and grouted in the concrete floors, where necessary at the machine ends, serve the motors from four ironclad switch-fuse boxes, and v.i.r. cables are run in screwed conduit for the lighting.

A supply is received from the Spalding electricity undertaking at 11,000 V, and the main distribution equipment in-



A can-labelling machine

cludes a Crompton 100-A T.A.P. ironclad circuit breaker, a metering panel with Landis and Gyr kWh, kVA, and m.d. instruments, a 150-kVA, 11,000/400-V delta-star Crompton Parkinson transformer, and cubicle l.p. oil switch, and a 70-kVA, 400-V, 3-phase condenser supplied by the Telegraph Condenser Co., Ltd., equipped with a circuit breaker made by Airedale Electrical & Manufacturing Co., Ltd. We noticed p.f. correction apparatus in the shape of an 8.9-kVA T.C.C. condenser installed with each of the 25-h.p. motors.

We are indebted to Wisbech Produce Canners, Ltd., for permission to visit the factory and to take photographs, and to Mr. W. Lambert, the branch manager, for his assistance in the collection of the above information.

The Central Board's Tariff. By H. M. Sayers, M.I.E.E.

How grid power will be sold

THE long-awaited tariff plan of the Central Electricity Board, the actual tariff for the Mid-East England Area, and a standard form of agreement between the Board and authorised undertakers for direct supply have now been issued. The following notes refer, as regards tariffs, only to supplies taken at area rates. The rates for the supplies sold to the Board by selected stations, and such part of the output therefrom as is deemed to be bought back from the Board by the owners, are not covered; those rates will be based on the "station cost of production" as set out in the Electricity Commissioners' "Allocation of Cost of Production" regulations.

The greatest anxiety of authorised undertakers has been with regard to the assessment and pricing of the maximum demand component of the tariff. The fears expressed have been: first, that transient peak loads may penalise undertakers unduly; secondly, that the demand tariff may cause difficulties in the fixing of tariffs attractive to new consumers and special loads. These anxieties have been appreciated by the Board. The memorandum implies that the tariff has been planned with the object of stimulating demand: from the development of load (so that concessions may be made in respect of large new consumers); from new areas; from the more intensive development of areas of supply which may come under more progressive control; and from seasonal loads between March and October inclusive.

Apart from such special concessions, the general scheme and the particular example of the Mid-East England tariff favour the growth of load by a sliding scale; the kW charge diminishes with specified "increments of demand."

Assessing the Demand Increment

The initial kW charge is fixed at £3 10s. per annum. For each "standard increment of demand" the charge is reduced by 5s. down to £2 15s. for the third increment. The increment varies with the maximum demand of the undertaking in the year 1932, called the "basic demand." The scale is set out in a table (see below).

The "standard increments of demand," which earn the reduction of 5s. for each increment, decrease by 100 kW for each 1,000 kW of basic demand.

If the demand on the undertaking during the year has been under 2,000 kW, the "basic demand" will be taken at that figure. This does not mean that a minimum of 2,000 kW is to be charged for, but that it is the basis on which the increment (3,000 kW) is to be fixed, so that the demand on the Board of an undertaking which has had a maximum demand of 2,000 kW or less during 1932 will be charged at the initial rate of £3 10s. until the demand is 3,000 kW over 2,000 kW, *i.e.*, 5,000 kW. Above that and up to 8,000 kW the rate will be £3 5s. for the excess; the next step down of 5s. to £3 will cover the demand from 8,000 to 11,000 kW. For larger basic demands the increments earning the reductions of 5s. each will be smaller as exemplified above. It may be asked: Why should the increments earning 5s. each vary inversely with the basic demand? This is the probable explanation.

To make a connection for service of any magnitude requires some minimum capital expenditure plus an amount governed by the magnitude. There is also an aggregate capital expenditure upon the transmission lines and sub-stations which results in an annual charge per kW of the estimated aggregate demand. If the latter charges are spread at a kW rate and divided by the kW of differing magnitudes the total kW charge is greater for the smaller than for the larger demands. A uniform initial rate is an average which necessarily charges the larger consumers more and the smaller consumers less than if strictly apportioned to the actual cost of each. To make the charges match the costs more nearly, the increases in demand earning reductions per kW are made larger for the smaller undertakings. The initial incidence of the kW charge is lightened for the smaller undertakings; in compensation they have to increase their demands by larger steps and the larger ones by smaller steps, in order to obtain reductions in the kW charge. For example:

EXTRACT FROM TABLE.

Basic Demand	Standard Increment
Exceeding 3,000 but not exceeding 4,000 kW	2,900 kW
,, 4,000 ,, ,, ,, 5,000 ,,	2,800 ,,
,, 5,000 ,, ,, ,, 6,000 ,,	2,700 ,,
up to 21,000 ,, ,, ,, 22,000 ,,	1,000 ,,

Undertaker A.—Basic demand, 2,000 kW, annual increase 500 kW. The first year at 2,500 kW will be charged £8,625 and the charge per kW will be £3.450. The fifth year at 4,500 kW will be charged £15,125 or at £3.361 per kW.

Undertaker B.—Basic demand 5,000 kW, annual increase 1,000 kW. The first year at 6,000 kW will be charged £20,750 and the charge per kW will be £3.458. The fifth year at 10,000 kW will be charged £33,175 and the charge per kW will be £3.3175.

The scale favours the smaller undertakings, but the sliding element gives a steeper reduction for quantity to the larger ones, tending to level matters. This may be in part justifiable by the fact that an increase of, say, 1,000 kW demand by a customer making a basic demand of 20,000 kW involves a smaller increment of capital cost than an equal increase for one making a basic demand of 2,000 kW.

Stimulating Load Development

The scale seems to embody an ingenious idea for helping the smaller undertakings and stimulating them to develop their business, without seriously burdening the larger ones. The undertaker gives his own estimate of his initial demand; it need not be the maximum demand of the year of reference, although the increments are reckoned from that datum line or from 2,000 kW, whichever be the larger. He will be charged on the actual maximum demand made on the system of the Board.

Mr. H. M. Sayers

The demand will be measured for the assessment of the charge during the four months January, February, November and December. The largest output in any half-hour in these months will be taken. The half-hour output is statutory. It eliminates "instantaneous peaks." The half-hours are specified as commencing at complete hours and half-hours of civil time. No substantial injustice is likely to accrue from one undertaking's peak half-hours being split between two of the regulation periods, whilst another's may happen to coincide with one of them. An undertaker who is offered an exceptionally large load during the latter months of a year may have the kW charge in respect of that load reduced, provided the Board's district manager is first consulted.

Power-factor is brought into the kW charge from a standard of 0.85 lagging, with an allowance of plus or minus 4s. 6d. per kW for each 0.1 by which the actual power-factor is better or worse than that standard. It is to be measured from the kW/kVA ratio of the maximum demand half-hour: this is rather favourable, as power-factor is usually best at the higher loads. There is also a plus or minus allowance for any variation of the local rates on the selected stations.

A Low Running Charge

The running charge for the Mid-East England Area is fixed at 0.186d. per kWh, with a variation for fuel cost. This price seems very reasonable, and few undertakings can generate at that figure. The memorandum sets out in detail the metering methods to be used, including those at selected stations. Diagrams of the meter connections are appended for all the combinations contemplated. The explanatory memorandum sets out that the tariff and procedure have been designed to favour development of the supply; the Board will be sympathetic to representations by any undertaker by which such development can be furthered.

It seems that a good job has been made of the initial conditions for regular trading by the Board. There may be some criticisms of details, but a good bid has been made for business likely to appeal to a large proportion of undertakers. When the method of assessment and the question of any alternative way of meeting the growth of demand are considered, the kW charge is reasonable. As to the running charge, few undertakings can get down to it; that may decided the majority.

The tariff as a whole offers strong inducements to the improvement of the load factor of authorised distributors. It looks as if the "point five" kWh charge may become a paying rate in two-part tariffs; this would encourage domestic loads, as well as those of many industries, great and little.

Rubber and Gutta Percha. By F. A. Middleton

The importance of their electrical properties in cable insulation

KELVIN showed that the speed with which a message can be transmitted along a cable varies, roughly, in inverse ratio to the dielectric constant of the insulating material. This constant is accepted as the most useful index of insulation trustworthiness, since it has the added advantage of ready computation.

No simple method exists whereby the constant next in importance, *viz.*, the electric absorption of the insulating material, can be measured; but a low absorption means a low power factor, so that by measuring the latter—a comparatively simple matter—an index to absorption is obtained. A low power factor means that a transmitted signal will not be affected by those which have immediately preceded it—obviously, a matter of supreme commercial import.

[Cromwell Studios

Mr. F. A. Middleton is a rubber technologist of varied experience and an authority on insulation problems

The third salient factor is the resistivity of the insulation, the desirable lower limit of which is fixed by the resistance of the conductor itself, since the former should be about one hundred times the latter. This implies a value of 10^{16} ohm-centimetres for the insulation—not difficult of attainment, even under severe working conditions, with rubber or gutta-percha insulation.

The refractive index of a thin, transparent sheet of purified pale crêpe rubber is 1.525 (Twiss & Shacklock). In the equation $k=n^2$ (electro-magnetic theory of light) where k is the dielectric constant, and n the refractive index, the value of k is 2.326. Direct electrical measurements on raw rubber have established that the greater the purity of the sample the nearer is this figure approached, a minimum value of 2.350 being attained with washed smoked sheet. The resistivity of crude rubber depends little upon its state of purity; its percentage power factor at 1,000-cycle a.c. is almost doubled by purifying, but this is due more to an attendant increase in the proportion of resin rather than to any attributes of the rubber hydrocarbon itself.

With crude gutta percha there is a much wider variation in electrical properties between different varieties owing to the more fortuitous methods of its production and the widely varying conditions of its jungle growth. The electrical constants of the gutta-percha hydrocarbon as such are of less interest than its behaviour with varying proportions of resin, since the crude product may contain as little as 10 per cent., or as much as 80 per cent. of resin.

The purest gutta (*i.e.*, almost 100 per cent. gutta-percha hydrocarbon) has a dielectric constant and power factor almost identical with those of rubber, both of which increase with increasing proportions of resin. Further increases in these two values also result from the presence of moisture, for gutta percha behaves like rubber in that small amounts of moisture (from 2 per cent. to 6 per cent.) cause large changes in power factor, and small, but appreciable, changes in dielectric constant.

The Effects of Vulcanisation

The behaviour of rubber depends upon the influence of vulcanisation upon the particular characteristics under consideration. Vulcanisation influences the electrical properties of rubber by increasing the dielectric constant and power factor, but it has little effect upon resistivity. The dielectric constant and power factor of pure rubber and sulphur mixtures (containing up to 8 per cent. of sulphur) increase with increasing percentages of sulphur, but above this proportion, even up to 32 per cent. of sulphur (the "saturation-point" corresponding to the formation of hard rubber) no increase in either properties is produced.

A curious feature, in the light of the strictly chemical and mechanical behaviour of mixings of rubber and sulphur, is that the dielectric constant increases with the time of vulcanisation and attains a constant value only after a prolonged over-curing, without giving any indication of the usually well-defined state known as "optimum cure." The only explanation seems to be that the progressive chemical union of rubber with sulphur is directly responsible for this increase in dielectric constant, for such a mix vulcanised at its optimum still contains chemically free sulphur, which can be made to combine by further prolonged vulcanisation.

The Use of Fillers

By compounding with varying amounts of diverse substances—usually termed "fillers"—the mechanical, physical, and chemical properties of vulcanised rubber may be varied infinitely. Whatever characteristics the raw rubber may have had, it becomes, at best, but the medium for the display of qualities and peculiarities introduced by these new substances. One class of compounds may give tensile strength; another class, abrasive resistance; a third, resilience; a fourth, stiffness; a fifth may merely serve as a diluent; and combinations of these can produce almost any imaginable characteristic.

A similar super-imposition of properties exists, also, where electrical properties are concerned. All fillers have a dielectric constant and power factor higher than crude rubber, and the electrical constants of the mixings employing them are, with two exceptions, intermediate to the individual constants of rubber and filler.

Table I shows how increasing proportions of zinc oxide (a reinforcing agent) affect the electrical constants of a mix composed of 93.75 per cent. pale crêpe, 4 per cent. palm oil, 2 per cent. sulphur, and 0.25 per cent. of an accelerator (an organic compound for hastening vulcanisation). The apparent irregularity of the resistivity curve is possibly due to the initial small additions of zinc oxide being chemically absorbed in "activating" the accelerator, but, once this has been provided for, the values show a steady decline for increasing amounts, in accordance with zinc oxide's resistivity of 10^{11} ohm-cms.

Carbon, in the form of gas black, is an important reinforcing material, and its conductivity is unique amongst substances used in rubber compounding. As table II shows, its incorporation results in a dielectric constant and power factor that soon become so large as to have little meaning (even 0.2 per cent. having an appreciable effect); while resistivity rapidly becomes of an order preclusive of usefulness in insulation work.

Litharge (lead monoxide) acts in a dual capacity as filler and accelerator, and also re-acts with sulphur to form lead sulphide and sulphate, thus annexing much of the sulphur available for vulcanisation. Thus we have the paradox of a decrease of the dielectric constant with the addition of small amounts of litharge, and it is not until 20 per cent. has been added that this value begins to ascend above that of the unaccelerated mixing. Power factor and resistivity are increased by even the smallest additions of this compound; but, in the latter case, this increase attains a maximum with 40 per cent. of litharge, yet does not decline to the value for the base mix until 88 per cent. has been added. In practice, the results

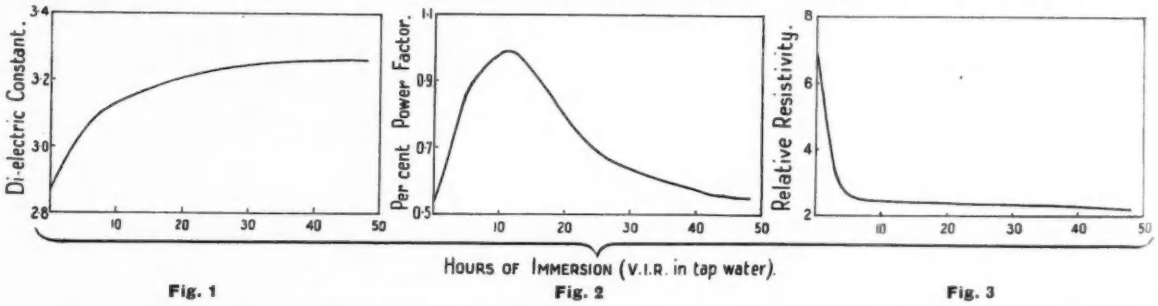
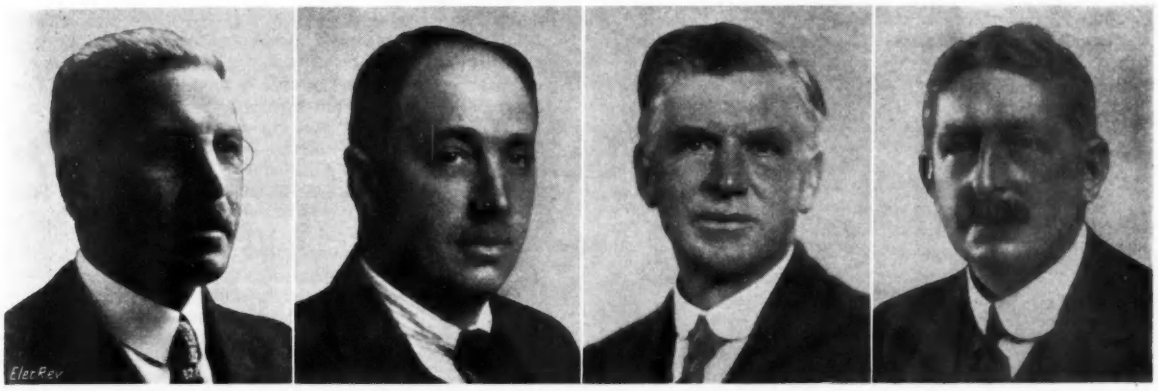


Fig. 1 Fig. 2 Fig. 3

Some Municipal Electrical Engineers



From left to right: Mr. R. W. L. Phillips, Bedford (*Elliott & Fry*); Mr. W. A. Walker, Kettering (*Chas. Speight*); Mr. W. A. Turnbull, Aylesbury; and Mr. S. E. Britton, Chester (*Chidley*).

produced by the addition of small amounts are the only important ones, since this substance is used only in small quantities.

A comprehensive range of fillers has been studied upon the above lines, but their effects are comparable, in greater or less degree, with that of zinc oxide.

Water Absorption

When crude or vulcanised rubber is immersed in distilled water, or exposed to atmosphere saturated with water-vapour, a progressive absorption takes place which gives no evidence of ultimately reaching a state of equilibrium. With a three per cent. salt solution, however, a month's immersion will suffice to produce a condition when no more absorption occurs—rarely above a moisture-content of three per cent.

TABLE I.

Per cent. Zinc Oxide.	Vulcanising Range in Minutes at 125° C.	Type of Electrode.	No. of Specimens.	Dielectric Constant at 1,000~	Power Factor at 1,000~	Specific Resistance in ohms/cm³.
				At Optimum Curing Time.		
					Per cent.	
1	15–40	Embedded Metal	8	2.50	0.33	45×10^{14}
1	1–25	Water	9	2.50	0.41	105×10^{14}
10	15–20	Water	4	2.61	0.52	95×10^{14}
20	15–20	Water	8	2.70	0.67	180×10^{14}
40	10–45	Water	8	3.57	0.71	150×10^{14}
60	15–20	Water	4	5.01	0.81	35×10^{14}
75	15–30	Water	7	7.72	1.05	7×10^{14}

The addition of fillers to rubber results in the apparent lowering of the percentage of absorbed water, because the rubber-content is itself reduced, but when the absorption is calculated as a percentage of the raw rubber, the effect of fillers proves to be nil. The accompanying graphs show the influence of immersion, in tap water, upon the electrical properties of a commercial grade of vulcanised rubber for a period of 48 hours.

TABLE II.

Per cent. Gas Carbon.	No. of Specimens.	Dielectric Constant at 1,000~	Power Factor at 1,000~	Specific Resistance in ohms/cm.³
			Per cent.	
0	6	2.68	0.29	115×10^{14}
0.2	5	2.73	0.44	160×10^{14}
2.0	6	2.89	0.48	145×10^{14}
10.0	4	4.11	3.4	185×10^{13}
20.0	3	5.97	8.8	3×10^{13}
25.0	6	—	—	6×10^{12}
35.0	5	—	—	16×10^{9}

There is but scanty reference in literature to the comparison of the electrical behaviour under immersion of rubber with gutta percha, apart from a publication by the American Bureau of Standards. This publication obscures the main issue by seeking to demonstrate the actual superiority of rubber over gutta percha as a submarine cable insulation. The relative merits of these two substances has been the subject of an exhaustive investigation by the Telegraph Construction & Maintenance Co., Ltd., which has been responsible for the manufacture and laying of a large majority of the world's submarine cables.

It has been shown by this authority that while rubber in its most highly purified form has excellent dielectric characteristics, it is incapable of retaining these over long periods of immersion in water. Gutta percha purified to the same degree, incidentally with much greater ease, exhibits a dielectric constant practically as low as that of purified rubber, and moreover, retains its good electrical characteristics indefinitely when kept under water (E.P. 307390).

It must not be assumed, however, that purified rubber has not a share of usefulness in submarine cable insulation, for, when judiciously used as a diluent in gutta percha, its progressive deterioration when immersed in water may be inhibited (E.P.'s 320370, 329981, 367851).

It is even possible to employ rubber which is not highly purified in conjunction with purified gutta percha, so great is the protective action of the latter against water absorption and consequent deterioration of electrical properties. The figures shown in table III, derived from a patent held by the Telegraph Construction & Maintenance Co., Ltd. (E.P. 329981) show this to a marked degree.

TABLE III.

Materials Under Test.	Initially.		After 3 months.	
	Dielectric Constant.	Leakance in micro-microhms/cm.³ at 2,000 ~ and 35° F.	Dielectric Constant.	Leakance in micro-microhms/cm.³ at 2,000~ and 35° F.
Crêpe Rubber.	2.2–2.4.	5–12	Very high.	Of the order of several hundreds.
50% Crêpe rubber and 50% dirt- and resin-free gutta percha	2.7	5–6	2.9	5–6

The undoubted superiority of dirt- and resin-free gutta over similarly treated rubber lies in the fact that the latter absorbs several hundred per cent. more water than the former, when immersed under similar conditions.

Water is the natural medium for the preservation of gutta percha, and figures showing the premature breakdown of this material can usually be ascribed to exterior influences such as oxidation of exposed ends of test pieces, or even incipient deterioration which has set in prior to the commencement of the test.

In view of the above results it is difficult to understand the basis for the conclusion of the American Bureau of Standards that "Rubber insulation may be made which is superior to gutta percha as an insulation for submarine cables."

Water Power in the Himalayas

Two hydro-electric power stations have recently been installed on the slopes of the Himalayas at altitudes of 4,000 ft. and 6,000 ft. To operate the first station water is collected from two small streams and run into a cement-lined concrete flume at the rate of about 21 cu. ft. per sec. The flume delivers into a forebay situated at a vertical height of 740 ft. above the station, whence a single 18-in. welded-steel pipe carries the water to the Pelton wheels below. The building is constructed entirely of corrugated galvanised-iron sheets. Inside are installed two Pelton wheels of Boving & Co.'s manufacture directly coupled to 600-kVA (0.75 p.f.) 3,300-V, 3-phase, 50-cycle alternators.

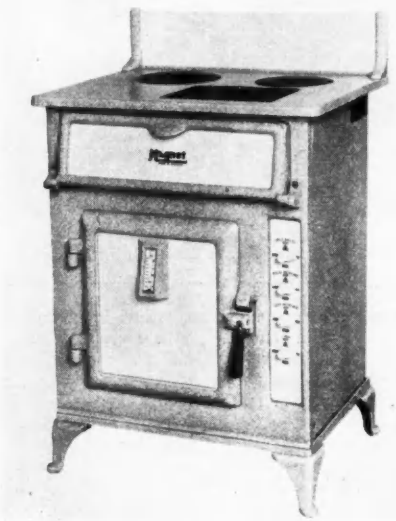
The second power station receives its water via a similar masonry flume, but about 4,100 ft. long, from a different stream. From a cement-concrete forebay, situated at about 90 ft. above the station, the water is taken by a 2 ft. 6 in. riveted steel pipe to the turbines. The rate of flow in the pipe is 75 cu. ft. per sec. This station, constructed entirely of wood, contains a Francis turbine directly coupled to a 648-kVA, 3-phase, 400-V, 50-cycle alternator. Transformers of the open-air type are installed at both stations to step up the voltage to 1,100.

The Standardisation of Cookers

IN introducing its two new domestic cookers, the General Electric Co., Ltd., is embarking upon a measure of standardisation which, it is believed, will satisfy 80 per cent. of the company's business and, by permitting mass production, enable prices to be reduced.

The company's aim is to meet adequately with the two new equipments the requirements of families averaging four persons and eight persons respectively. The new cookers are intended to supersede the whole of the existing domestic range, with the exception of the largest model, D.C.1031. It is believed that four models will be sufficient, although the two new equipments will serve for the bulk of the business. The new cookers are styled D.C.432 and D.C.732, and they have total loadings of 5,700 W, and 7,200 W, oven cooking spaces of 12 in. wide, 13 in. deep and 13¼ in. high, and 14 in. wide, 15½ in. deep and 15½ in. high, overall dimensions without splash guards of 25¼ in. wide, 19¾ in. deep and 36in. high and 26¾ in. wide, 22 in. deep, and 36 in. high. The D.C.432 has a 10 in. by 8 in., 1,800-W grill and simmering plate and an 8 in. dia. 1,800-W hotplate. The D.C.732 is equipped with a similar combination plate and hotplate *plus* a 6 in. dia. 1,000-W hotplate.

The company has decided to redesign the 8-in. and 8½-in. hotplates incorporated in its cookers so as to increase the loadings of these plates from 1,600 and 1,800 W to 1,800 and 2,000 W respectively, while both maximum wire and casting temperatures have been substantially reduced. With these increased loadings the boiling time is reduced by over ten per cent., while the life of the plates, by virtue of lower maximum temperatures, will be even longer than that attained by the plates with the lower loadings they have superseded. The two years' guarantee for these plates is in no way affected by the heavier loadings which have been provided.



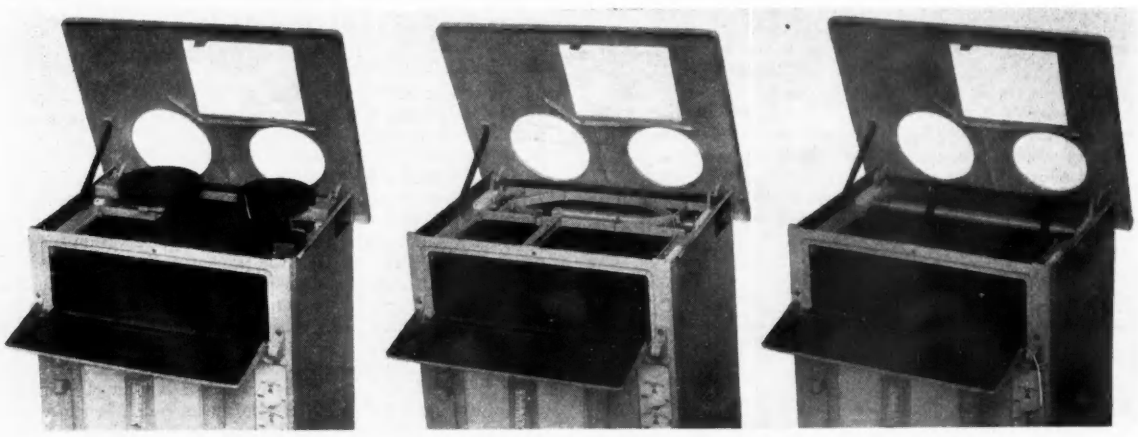
One of the " Magnet " cookers

The hotplates are carried in standard spiders, and the supporting frames lift out very easily. Indeed, it is only a few moments' work to bare the cooker to the oven top. Plug-in contacts and an earth pin are incorporated, and there is a levelling device which permits the hotplate to be properly aligned and adjusted.

Additional warming cupboard width is afforded in both cookers by the incorporation of the switches in the main body beside the oven. The warming cupboard of the smaller model measures 19½ in. wide, 12¾ in. deep and 5¾ in. high. Side and bottom oven heating is employed, and the elements are substantially mounted on busbars.

The space between the oven lining and the frame at the front is cemented up to prevent steam leakage into the heat insulation. Deciding on the oven furniture is always a difficult matter, but we think that the staunch advocates of the browning sheet will relent when viewing the unusually substantial oven pan, with its rounded corners, and the three non-tiltable grid shelves.

When in the " off " position each switch pointer hides from view a vitreous-enamelled red indicating lozenge, so that in all " on " positions there is a conspicuous indication. Another important feature is the fixing of a new type of mercury thermometer in a vertical sloping position at such an angle that it can be read easily close up to and at a distance from the cooker. The only optional " extra " is a plate rack, and the standard and only finish in which the cookers are available is greycoat porcelain enamel. The prices of these cookers are: No. 432, £12 15s.; and No. 732, £15 15s.



Constructional views showing the ease with which the hob equipment can be dismantled

A New High-head Pumped-storage Plant

ONE of the latest hydro-electric pumped-storage plants is the Schluchsee-Hausern Works, which was recently put into operation in the Black Forest. The large storage reservoir, with a capacity of over 23,700 million gallons, was formed by building a dam across the Schluchsee. The reservoir is large enough to equalise the load on the station during the day by pumping from the Schwarza reservoir to the Schluchsee, and also to store sufficient water to make up the power production required over long dry periods.

The power obtained is used for supplementing the output of certain power stations on the Upper Rhine between Lake Constance and Basle during winter, a time of low water in the Rhine and of plentiful supplies in the Black Forest. A horizontal conduit connects the lake-reservoir with the deep-cut Schwarza Valley. On the slopes of this valley the conduit emerges into the open and connects up with two pipelines nearly 10 ft. in diameter which lead to the power house lying about 620 ft. lower down on the side of the Schwarza reservoir.

Each of the four water-storage sets comprises a 26,700-h.p. water-pump, a 49,300-h.p. turbine, and a generator (the latter running as a motor when driving the pump), combined into a vertical unit with their shafts on the same axis. The generator is uppermost, below it is the turbine, and the pump is mounted on the floor of the power house. Each turbine and pump is connected to one of the two pressure pipelines through a branch pipe, which can be shut off by means of a spherical valve. The high-head Francis turbines have cast-steel intake spirals, completely embedded in concrete, which are provided with supporting rings on which the generators rest. The discharge from each turbine passes through a cast-iron bend and draught tube into the Schwarza reservoir.

As a result of the pumping operations, the water level in the reservoir fluctuates heavily from 16½ ft. above the middle of the turbine to 19¼ ft. below; an overflow sill prevents the turbines from working with a static suction head greater than 10 ft. The turbine is rigidly coupled to the generator, and runs idle when water is being pumped; when the set is being driven by the turbine the pump is disconnected. The speed of the turbine is regulated by an oil-pressure servomotor operated from the governor. The pumps have two stages and are fitted with movable guide vanes, enabling the driving power to be gradually increased from no-load up to the full delivery.

The E.T.B.I. Ball

THE ball held in aid of the funds of the Electrical Trades Benevolent Institution on November 18th was a bigger success than ever before, and the sale of 415 tickets provided a very substantial margin over the number necessary to clear expenses. The size of the concourse may have been due in part to the belief that there would be no speeches; and there were none, Mr. R. P. Sloan, this year's president, merely making reference to the presence of Mr. P. J. Pybus, the Minister of Transport, and thanking him for the interest he thus displayed in the work of the Institution.

The electrical world and his wife were well represented at Grosvenor House that night. Our staff photographer succeeded in snapping some well-known people—no mean feat considering the activity which nearly everybody displayed in getting on to the floor each time the orchestra struck up.

The interest in the proceedings was maintained right up to the end, which came at 2 a.m. Even at that hour it was quite clear that many would like to have stayed on until "morning in the bowl of night had flung the stone that put the stars to flight." The president, the secretary and the executive have every reason to be well satisfied with the results of their efforts.

The pleasure that we all feel at the manifest success of any electrical function is in this case enhanced by the knowledge that the profits will be devoted to a benevolent purpose.

The result of this year's collection will not be available for another two or three weeks, as subscriptions are still steadily coming in. But Mr. Sloan has the satisfaction of knowing that last year's total has already been very considerably exceeded.

1. Mr. R. P. Sloan and Miss Sloan receiving Mr. and Mrs. S. E. Monkhouse (Mrs. E. S. Hoar and Capt. J. T. Keeping in background). 2. Miss Page, Sir Andrew Duncan, Lady Brooke, Miss Scott, Mr. Harold Hobson, and Sir John Brooke. 3. Dr. McCullum, Miss Marryat, Mr. and Mrs. John Marryat, and Mr. and Mrs. Howard Marryat

New Diesel-electric Locomotives

ON Monday this week Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., staged at their Scotswood Works, Newcastle-on-Tyne, demonstrations of Diesel-electric locomotive equipment. The most recent development of the company is the building of three 1,700-h.p. "mobile power houses" and one main-line locomotive of the same capacity for the Buenos Aires Great Southern Railway.

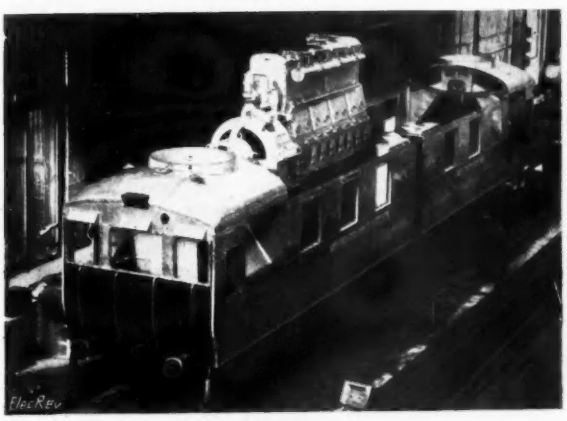
The order is the result of the successful operation by this company of two 1,200-h.p. Diesel trains which have covered some 163,000 miles. These trains are in regular service on a 14-mile run with eleven stops. The average fuel consumption per train-mile on this service is 9.4 lb., the fuel cost being 4½d. per train-mile.

"Mobile power house" is perhaps a little misleading, at any rate to those concerned with ordinary supply work. The idea is to supply the motors of the self-driven coaches of the train with which the power house travels, or forms a part. Each power house is to be used with eight 80-foot coaches with a seating capacity of 1,000 passengers (equivalent to twelve or fourteen coaches in Great Britain). It has four motors on its bogies for its own propulsion, the remaining motors being on the carriage bogies. The motors are designed for a maximum train speed of seventy miles per hour.

The power house is made up of two articulated units each carrying an 850-b.h.p. eight-cylinder Diesel generating set with cooling equipment, fuel tanks, &c. Each generator supplies current to half the motors on the train, so that in the event of failure of one engine set the train can proceed at reduced speed with power from the remaining set. The maximum acceleration of the train, which weighs 550 tons gross, is automatically controlled in such a way that the engines cannot be overloaded.

The main-line locomotive has two sets of motors, one for working freight trains in the harvest season and another for fast passenger working at speeds up to seventy miles per hour. The maximum tractive effort for freight working is 62,000 lb. at 4 to 1 adhesion. The locomotive weighs 148½ tons in working order with fuel, and its length over buffers is 75 ft. 3½ in.

The locomotive is of articulated design similar to the power houses, but with its bogies equipped with six electric motors capable of absorbing the full power of the two 850-b.h.p. engines. The Diesel engines can be used singly when required. A driver's compartment is provided at each end of the locomotive with controls duplicated on both sides, and safety devices are fitted as in the power houses. The generating equipment is interchangeable with that of the power houses.



One of the Armstrong Whitworth "mobile power houses" being fitted with its engine

One of the power houses has been completed and the others are still under construction. The equipments as a whole have been built by the Armstrong Whitworth concern, the engines being supplied by Sulzer Frères, the generators by Brown Boveri & Co., and the motors and control gear, &c., by the English Electric Co., Ltd.

We understand that conditions of the specification made it necessary to employ foreign equipment, but at luncheon Sir Brodie Henderson, consulting engineer for the Buenos Aires Railway, said that it was likely that further units would be British throughout.

Modern Lamp Manufacture

A good example of applied physics and chemistry

OPPORTUNITIES were given us during a recent visit to the factory at Preston of Ensign Lamps, Ltd., to delve a little more deeply than is usually permitted into the "secrets" of lamp manufacture. The company produces lamps in sizes from the pigmy sign lamp upwards, embracing 457 different types, sizes and wattages, of vacuum and gasfilled lamps. A special production is the "Ensignette," which has a guaranteed consumption of less than 10 W and is specially designed for use in corridors or as a night light.

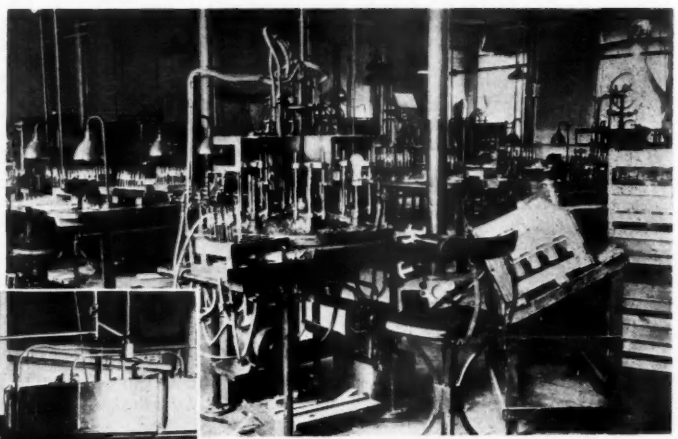
The manufacturing machines are generally of the rotary type and represent up-to-date practice in design. Flexibility is the basic consideration in the plant lay-out, so that the failure of any one machine does not hold up the following sequence of operations. Because of the very high temperatures at which the incandescent filament operates, and the consequent chemical activities, lamp manufacture is anything but a simple mechanical assembly of parts. For example, the leading-in wires from the socket to the filament have to be provided with special junctions where they form a solid connection with the stem of the lamp. The junctions must make perfectly vacuum-tight joints with the glass, and thus their coefficient of expansion must be the same as that of the glass.

On a core of nickel-iron alloy is first deposited a thin film of copper which is subsequently converted to a salt by treatment with molten borax, producing a reddish compound sheath which provides the necessary "wetting" (intimate contact) of the glass at the joint. After assembly, the complete stem, consisting of a short length of glass tubing with a flared end to which the bulb is ultimately sealed, a short length of glass rod, the leading-in wires and a small inner tube through which

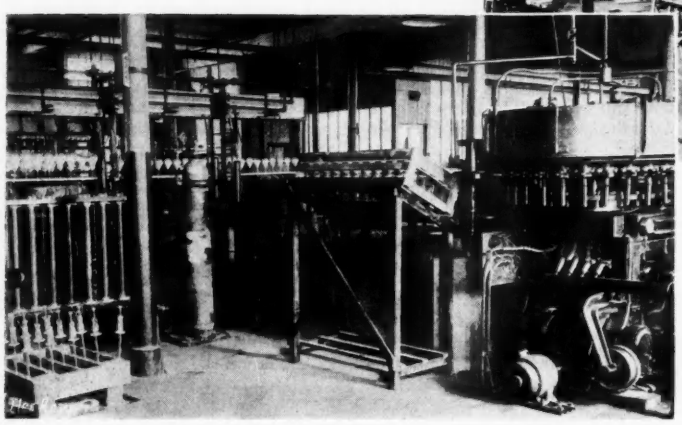
The Ensign lamp factory

by a process in which the gas is passed through a system which reproduces in detail the operating conditions in a finished lamp, on a much larger scale, of course, so that the gas mixture finally employed is as perfect as is required.

Chemically cleaned glass is by no means clean from the lamp maker's point of view, and the surfaces of the glass bulbs initially contain relatively large volumes of water vapour and dissolved gases. These are removed by subjecting the bulb to a fairly high temperature and "scavenging," *i.e.*, continuously diluting the impurities by intermittently flooding the exhausted bulbs on the machines



Stem and bulb sealing machines



Stationary and rotary exhausting equipments

with purified nitrogen, during the exhausting operation.

Filament Making, Exhausting and Frosting

The heat losses introduced by gas-filling are more than compensated for by the higher permissible temperature and therefore more efficient filament; the higher temperature incidentally accounts for the whiter light of the gasfilled lamp. In the finer spirals something like 1,100 turns are accommodated per inch; accordingly they call for much care and delicate handling. The spirals are formed by wrapping the tungsten wire at high speed round mandrels, which are subsequently dissolved in acid which has no effect on the filament itself.

At the "Ensign" works both methods of exhausting and filling are employed, the rotary one for the smaller lamps and the stationary and more orthodox method for the larger lamps. In the latter case the more positive and trouble-

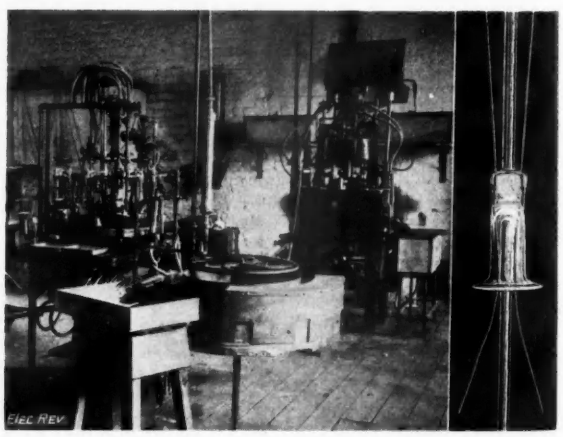
the air from the bulb is conveyed during exhaustion and the gases are passed into the bulb afterwards, is thoroughly annealed to relieve the stresses and strains in the formation of the glass "pinch." On the end of the glass rod are inserted several molybdenum wires by the extremities of which the filament is supported, the ends being securely clamped to the nickel electrodes.

The effectiveness of this process is determined by examination of a sample with a pair of crossed nicols (prisms) in polarised light. Strain is evidenced by coloured patches in the pinch when so viewed, while in a perfectly annealed stem this discoloration is absent.

Gas Filling

For gasfilled lamps a mixture of argon and nitrogen is used. The former, representing the major volume, is selected for its relatively low thermal conductivity and almost complete immunity from interaction with the incandescent tungsten filament. The nitrogen prevents "flash-over," brought about in most cases by the ionising effect of the high-temperature filament. It raises the ionising potential to a value not likely to be met with in common use. In the larger lamps, 750 W and above, the gas content is wholly nitrogen because of the very much higher operating temperature of the filament.

By virtue of the particular methods of manufacture of the gases (fractional distillation of liquid air) there is an inevitable but undesirable gas content which, if allowed to remain, would seriously impair the tungsten filament and reduce the candle power of the lamp in a very short while. The most serious offenders are oxygen and water vapour. These are eliminated



A stem-making machine complete with annealer, and a stem showing the special junctions

free connections allow a greater flexibility in production, and on the whole result in a smaller percentage of rejects. Completeness of exhaustion is tested in all cases by the application of a high-frequency potential to a lead from the filament. No discharge indicates a perfect vacuum, and an intense reddish-blue light denotes residual air. An elaborate overhead system serves the testing electrodes at the exhausting machines, and in the case of the rotary automatic machines the lamps pass under fixed flexible electrodes.

Internal bulb frosting results in a lower light absorption for a given frosting effect. It is necessary to treat the bulb twice. No matter how delicately the first frosting may be carried out the mechanical strength of the bulb is seriously reduced, but a second and weaker treatment restores the strength to about 85 per cent. of the clear glass value. One of the final processes consists of attaching a brass cap to the top of the bulb by means of a heat-resisting "Bakelite" cement.

Mr. A. J. Sedwell, works manager, to whom, with Mr. F. T. Green, one of the company's directors, we are indebted for help in the collection of this information and the accompanying photographs, says that many people, including some technical men, believe that a lamp that is not strictly true to its rating is not a good one, in spite of the plus or minus 10 per cent. tolerance allowed by the British Standard Specification. Slight variations in the section of the tungsten filament wire are inevitable because of the slight wear of the dies through which the wire is drawn. But the important point is that the light should be proportional to consumption.

The Overhead Lines Association

FRIDAY last week was a busy day for the Overhead Lines Association. There was a visit to the works of Hackbridge Electric Construction Co., Ltd., at Walton-on-Thames in the afternoon, and in the evening the fifth annual conversazione and supper-dance was held at Harrod's Georgian Restaurant.

Probably the most interesting equipment seen at Walton, from the members' point of view, was a few dozen pole-mounting transformers of from 10 to 50 kVA with simple arrangements for hooking on to the cross arms of "H" poles.

As usual there was an exhibition of overhead line equipment in conjunction with the conversazione. Mr. J. F. Barr illustrated by short lengths the construction of his concrete poles which are extruded with vertical reinforcement of any section and continuous spiral binding. The Better Lines Co. showed a roller clamp with a seating equivalent to a 3-ft. pulley, two- and three-way service fittings providing for any angular service deviations, stay plates, and a corkscrew spindle which permits placing the conductors in triangular formation, &c.

Metal-hooded and "Hewlett" insulators for up to 33 kV and l.p. pin-type and shackle insulators were shown by Bullers, Ltd., who also had a cone-grip clamp for steel-cored aluminium conductors for effecting sag readjustments. The Court Works, Ltd., arranged a group of galvanised malleable and grey iron castings, such as insulator bells, clamp bodies, &c. The Croydon Cable Works, Ltd., demonstrated applications of "Pernax" for protecting distribution boxes, transformer terminals, &c. A wide range of accessories shown by Mr. F. J. Down included various types of anchors, an earth augur, a guy clamp for stay wires, a slack puller for up to 10,000-lb. strains, and a special cable grip for steel-cored aluminium cables. This exhibit also included 7,500-V fuse-switches in cypress wood and porcelain housings.

A new clamp-on pole-mounting switch was shown by Drake and Gorham, Ltd., while Electric Control, Ltd., exhibited a 132-kV high rupturing capacity fuse and also 11-kV fuses. Electric Transmission, Ltd., displayed an 11,000-V, 3-phase horizontal remote-control air-break switch insulated for 22 kV, and also a single-phase 33-kV "J.R." fuse. Most of the popular testing instruments of Evershed & Vignoles, Ltd., were to be seen, including the latest addition, the "Wee-Megger."

Perhaps the novelty of the exhibition was a working model of surge generator and surge absorber testing equipment shown by Ferranti, Ltd., who also displayed a service surge absorber, a safe load indicator, a disc-type induction motor for automatic voltage regulator driving, and a solderless distribution transformer terminal. Griffiths Bros. & Co. (London), Ltd., showed films of "Armacell" insulating varnish from which zinc backings had dissolved, and films of "Ferrodor" paint which had been immersed in acids. "Pyrex" insulators made of a transparent borosilicate glass having good electrical properties were shown by James A. Jobling & Co., Ltd.

The exhibit of Johnson & Phillips, Ltd., included a 10-kVA pole-mounting transformer, a pole-mounting "E.K.C." oil circuit breaker, an air-break weatherproof switch and fuse box for protecting the l.p. sides of pole-mounting transformers, an 11-kV pole-mounting terminal box, and automatic reclosing mechanism for "E.K.C." circuit breakers. An 11-kV, 100-A type "G.P." oil circuit breaker (50,000 kVA r.c.) and a 22-kV, 400-A type "A.A.1" high-pressure contact air-break switch, were displayed by Metropolitan-Vickers Electrical Co., Ltd.

At the O.L.A. Conversazione

Standing: Messrs. C. F. Mounsdon, H. W. Grimmett, N. D. Watsham, G. W. Molle (Hon. Sec.), J. L. Eve, W. A. Kennett, and J. H. C. Brooking. Seated: Messrs. T. Rich, W. Fennell, A. L. Stanton (President), R. J. J. Swan and R. B. Matthews

By a model of a typical span of l.p. overhead line incorporating e.h.p. cable, and a sample of three-core 0.007 sq. in. cable complete with a sample suspension clamp, &c., the Pirelli General Cable Works, Ltd., demonstrated a new type of catenary cable. Switchgear & Equipment, Ltd., showed several new items, which are referred to elsewhere in this issue. Examples of the products of Venner Time Switches, Ltd., included an automatic oil-break time switch, the "Radslot," a "Poultry" switch, &c.

The Yorkshire Switchgear & Engineering Co., Ltd., exhibited a model of a push and pull air-break sectionalising switch for up to 33 kV with the moving contacts on a sliding member operating in a central guide, an end dividing terminal box embracing fuse or link gear, and various types of combined end strains and service fuses. The Palnut Co., Ltd., showed its safety lock washer and "Bulldog" steel safety joint plates for keying joined wood members of transmission poles, &c. A pole-mounting oil switch, 11,000 V, 150 A, shown by Crompton Parkinson, Ltd., has automatic series overload trip coils carried by the moving contact arms.

Switchgear and Equipment

The products of a new manufacturing concern

FULL advantage has been taken of the considerable scope offered to manufacturers in simplifying the problem of economically equipping and tapping overhead distribution networks by Switchgear and Equipment, Ltd., which during the few months since it established its works at Banbury has produced outdoor air-break high-voltage switch- and fuse-gear of sound design and substantial workmanship.

Their specialities include improved e.h.v. liquid fuses for 11/66 kV; 11/33-kV pull-down switch fuses; 11/33-kV lift-out fuse isolators; 11/66-kV disconnecting switches; 11/66-kV isolating links; 11/66-kV fuse mounts; and 11/22-kV ring main isolators. These items will eventually be made for up to 132 kV.

A special shop is set aside for the manufacture of high-voltage fuses, the equipment of which includes drying-out ovens for excluding moisture, and thermostatically controlled electric muffle furnaces for pre-heating the component parts prior to attaching, in jigs, the metal end ferrules to the "Pyrex" glass cartridges containing arc-extinguishing liquid. A new liquid, distilled in the works, is now used for this purpose. The incorporation of a reinforcing arc shield provides protection for the weakest part of the container, while there is a domed safety pressure vent on the outside of the top ferrule instead of inside, the ferrule being ground on and made quite moisture proof.

A lift-out fuse isolator

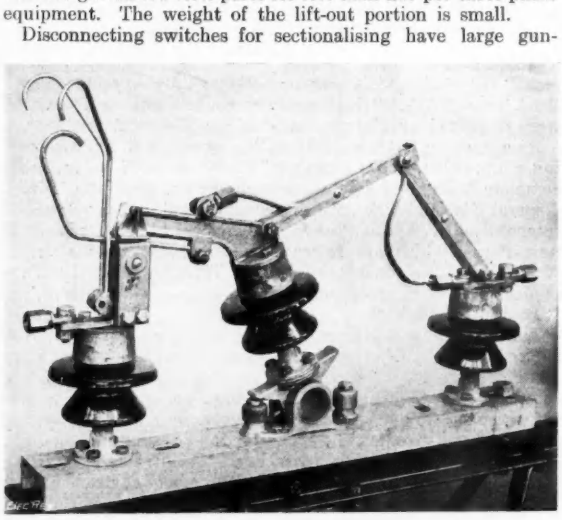
Inside the "Pyrex" tube a small tension wire keeps a strong spring extended and relieves the fuse wire itself of strain. When the fuse wire "blows" the tension wire releases the spring, which draws the lower terminal (and also the arc) farther down into the liquid. At the same time a nozzle-like cap on the collapsing spring head forces the liquid to stream upward towards the top terminal, so quenching the arc.

A Switch-fuse for Rural Lines

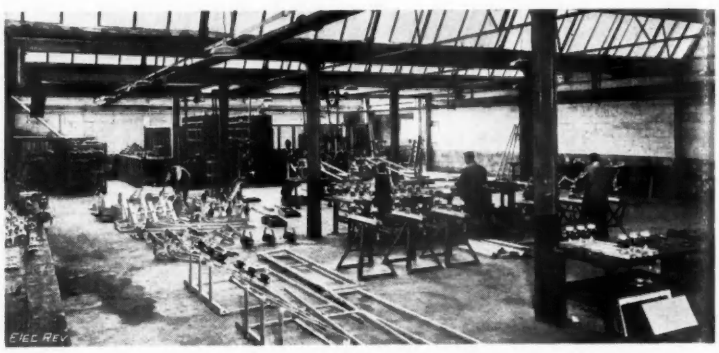
The "lift-out" fuse isolator illustrated can be really easily operated with a 16 ft. rod, and the fuses removed and replaced from ground level. Its special application is for transformers up to, say, 50 kVA on low revenue producing lines in rural areas, and it can be supplied complete with fuses and B.S.S. 22-kV insulators, mechanical line cone grip connectors, nickel-plated current-carrying parts, and hot galvanised steel parts for less than £10 per three-phase equipment. The weight of the lift-out portion is small.

Disconnecting switches for sectionalising have large gun-metal-lined bearings incorporating buffer stops for relieving the rocking insulators of mechanical shock. Self-aligning pressure contacts and stirrup operating handles are fitted.

The company's switch-fuses are operated on the pull-down principle, and the fuses can be renewed from ground level by one man. The moving member is controlled by a single compression spring in conjunction with ingeniously contrived cam leverage which balances the movement so well throughout its whole travel that single-handed operation is made possible.



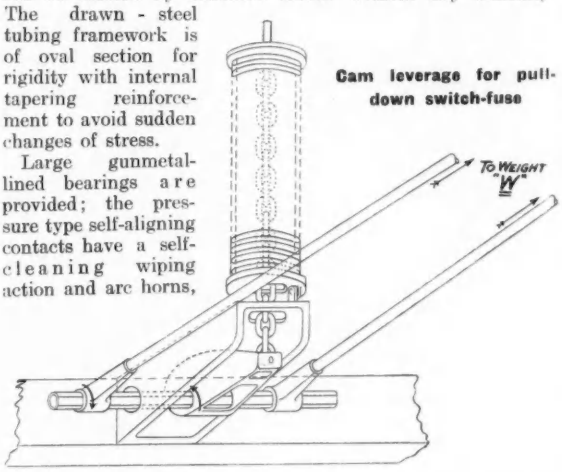
One phase of a three-phase disconnecting switch



A part of the assembly shops

The switch "stays put" in any position in its downward and upward movements when the operating handle is released. It is self-locking in the closed and lowered positions, is equally suitable for single "H" or "A" poles, and can be erected by unskilled labour without any difficulty. The drawn-steel tubing framework is of oval section for rigidity with internal tapering reinforcement to avoid sudden changes of stress.

Large gunmetal-lined bearings are provided; the pressure type self-aligning contacts have a self-cleaning wiping action and arc horns,



Cam leverage for pull-down switch-fuse

and they are sufficiently clear of the fuses to be immune when the latter "blow." The insulation of the 11-kV pattern exceeds the requirements of B.S.S. 137/1930 for 22 kV. Current-carrying parts are nickel-plated throughout, and will accommodate liquid or rewirable fuses, steel parts being hot galvanised or cadmium plated.

The Works Equipment

The factory at Banbury, Oxon., is on the G.W.R., L.M.S., and L.N.E.R. lines. There is some 5,000 sq. ft. of administrative, executive, and drawing office accommodation. The floor area of the factory shops is at present 10,000 sq. ft. with room to extend to approximately 30,000 sq. ft. There is an electrodeposition shop for plating component parts, and an important section is that which houses the insulator porcelain-cementing plant with a thermostatically controlled humidity chamber for setting the cement.

Machine-tools and assembly racks or benches are arranged in line sequence down the several bays, each of which is devoted to one type of product, eventually reaching at the far end of the factory the screened testing department in which a 150-kV transformer has been installed, beyond which are the packing and dispatch sections.

An 11-kV overhead line, consisting of two H-pole terminals and two single-pole intermediates, has been erected permanently outside the works for demonstrating and testing switchgear under open-air working conditions before it is put into regular production.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Praise for the "Telex" System

DURING the discussion at the INSTITUTION OF ELECTRICAL ENGINEERS on November 17th of the paper entitled "The Inland Telegraph Service: The Introduction of Modern Machinery and Methods," by Mr. R. P. Smith, reported in our last issue, Mr. H. H. Harrison stated that the use of a.c. as the transmitting means was growing, which enabled line plant to be co-ordinated so that wherever a telephone network existed facilities for telegraphy were available, the same intermediate plant being utilisable for communication, whether by telephone or telegraph.

The segregation of all apparatus other than the printer apparatus on racks arranged together at one part of the instrument room had been American practice for many years, and was obviously the right thing to do; the substitution of milliammeters for the old differential galvanometers was also a good step. He believed he was the first to propose the method of withdrawing or inserting capacity step by step by means of a rotary switch, but thought the Post Office method simpler and more elegant than his. Many provincial firms with London connections would find the new "Telex" system a real money-saver.

The Special Claim of the Telegraph

Col. Sir Thomas Purves (engineer-in-chief of the G.P.O.) said that the apparently slow progress made with machine telegraphy in this country was due to the economic inferiority of the many new systems with which the Post Office had experimented to the Morse system, including the duplex and high-speed Wheatstone systems. The Wheatstone units had run for years at 400 words per minute, and once he and a mechanic had made one run at 600 words per minute. But the Morse system had been beaten by the development of a comparatively simple, robust and cheap teleprinter, and of means for utilising the by-product circuits, which could be obtained from the telephone system at very little cost and without reducing the number or efficiency of the telephone panels available.

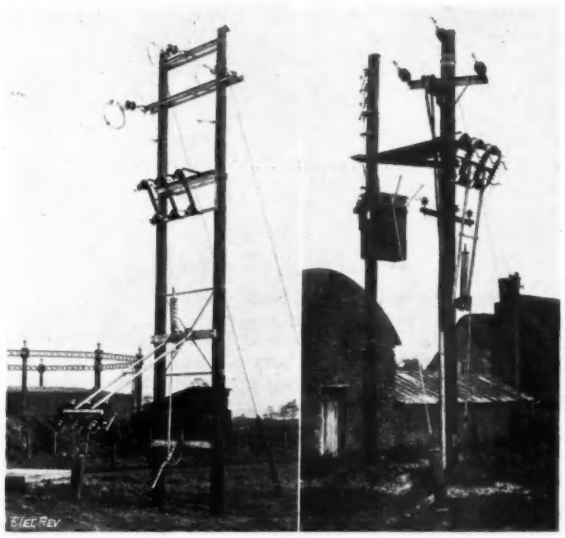
Many rural and small-town services were carried on at a loss; he believed no other country had carried that kind of service so far as we had. Telegraphy was the cheapest method of long-distance immediate communication, available to every member of the public; it thus differed from the inter-communicating telephone, which was installed for personal advantage, and had no claim to any subsidy from non-subscribers, as the telegraph had. The "Telex" switching system, which provided alternative telegraph and telephone communication at the will of the user, had no counterpart elsewhere. He hoped that within the next few months the telephone exchange system would be available for a purely telegraph service at a lower rate than the trunk-line charges.

Special exchanges were used in America, as the many teleprinter users there formed a ready-made clientele.

Mr. L. Simon (who was at the head of the 1928 Commission of Enquiry to the United States), said that the change made by the Post Office had been the most revolutionary in the history of telegraphy in this country, and it was due largely to the co-operation of the staffs that the scheme had worked so smoothly. He hoped that an increasing proportion of telegrams would be delivered by telephone or by teleprinter through the "Telex" system.

Possible Objections

Mr. J. C. Besly, speaking on overseas telegraph services, said that there were thirty-two possible combinations in the five-unit code used for the teleprinter, so that if a letter were mutilated there were twenty-five chances in thirty-one that it would be turned into another letter. This feature made the teleprinter unsuitable for use on most wireless services and long submarine cable circuits carrying a substantial proportion of code traffic. Superposition upon telephone lines would provide all the channels needed for internal teleprinter communication, but owing to the high capital cost of a chain of submarine cables forming a cable circuit and of large wireless stations overseas services must be worked at a high speed; that could not be done with teleprinters. Some of the inland telegraph high-speed channels would also be unsuitable for teleprinters, due to interference, which on occasions reached 45 per cent. of the signal amplitude.



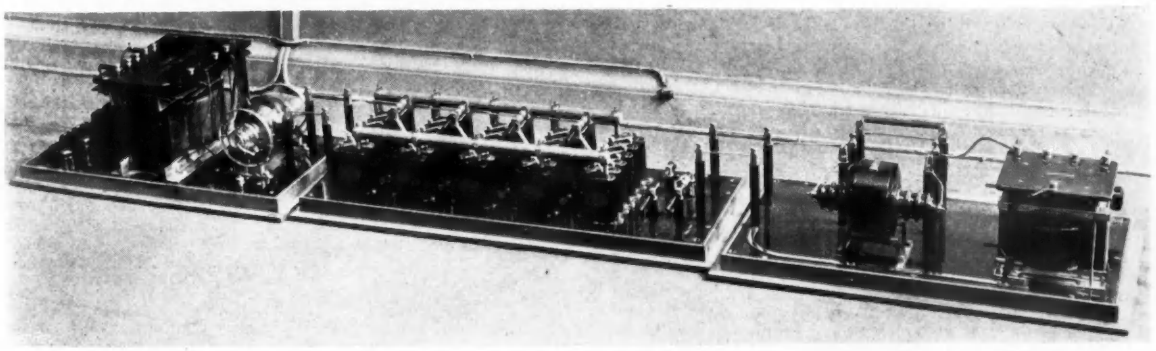
(Left) A pull-down switch-fuse on a demonstration line at the Delavox works. (Right) A unit on one of the Northampton Co.'s lines. (See opposite page.)

Mr. H. Kingsbury asked whether it would be practicable to combine the teleprinter motor with its own local and line current generators, for obtaining a greater efficiency than with a rectifier. In his opinion, the "Telex" was not so much a telegraph service as a telephone service, as the subscriber did his own operating.

An International Service Probable

Mr. L. Stuart Jones said that since this mechanisation sickness had increased among the female staff, owing to the noise. Mr. L. S. Crutch suggested that banks and other large organisations should be able to communicate simultaneously with their branches over a large number of circuits. He believed there was a future for public teleprinter booths on stock exchanges and racecourses. The only advantage of double phantom working over subaudio appeared to be the high-pass filters in the telephone circuit, but four wires instead of two were required per circuit. Was the vibrating relay entirely satisfactory? On a foreign system using ordinary relays the line current was only four milliamperes.

Mr. T. J. Mercer stated that many inquiries regarding the



Shown at the O.L.A. exhibition (p. 779). Messrs. Ferranti's model high-voltage artificial lightning surge generator

"Telex" system had been received from the Continent, and probably consideration would be given to an international service. The by-product circuits must, he thought, continue to be worked on d.c.

Mr. A. O. Gibbon, as an examiner in technical subjects, expressed high appreciation of the work of the candidates in connection with the new testing and maintenance scheme. There were about 650 different parts in the teleprinter. For the first time women were being employed on testing and maintenance duties by the Post Office.

Mr. Smith intimated that he would reply to the discussion in writing.

Main-road Lighting Considerations

THE paper on "Main Road Public Lighting" which was read before the YORKSHIRE ASSOCIATION OF THE INSTITUTION OF CIVIL ENGINEERS, at Leeds, on November 17th, was open by special invitation to members of the electricity and gas industries interested in street lighting. The speaker was Mr. C. Cameron Kirby, of the Salford Electricity Department.

Mr. Kirby, devoting himself primarily to the lighting of main roads in urban areas, made special reference to the tendency in recent years to use larger candle-power light sources and to mount them higher from the road surface. This, of course, tended to give a greater spread of illumination; the higher the light source, and the closer the spacing, within reason, the better would be the illumination and the visibility. If the roadway was adequately lighted, he said, illumination on the footpath was sufficient to enable the motorist to see when pedestrians were about to step off the path, and therefore no special treatment of that part of the highway was required. Every urban main road should be lighted with such adequacy that the motorist should be able to switch off his headlights. General visibility might be increased by reflected light from buildings, advertisement hoardings, tramlines, &c., but the result of this reflection, as expressed in foot-candles, was really very slight.

The reflection of light from the road surface itself, on the other hand, was a matter of much importance. It would appear that a cement or concrete surface gave the best results. There was a very wide difference in illumination on roads of different surfaces from the same amount of light flux per unit area. It might be thought that the ideal lighting installation would be the one giving even, unvarying illumination on the road surface, but that was far from the fact. The visibility of objects was usually very indifferent as daylight was passing, the combined effects of the twilight and artificial lighting producing a comparatively uniform illumination in which no object on the road stood out prominently. Objects were detected much more readily in silhouette than by direct lighting; therefore the use of contrast was very desirable and a "variation range" of maximum to minimum illumination of ten to one was considered by modern lighting experts to be a satisfactory figure.

Too Much Secrecy!

"INDUSTRIAL Research and the Nation's Balance Sheet" is the subject of the Norman Lockyer Lecture of the BRITISH SCIENCE GUILD, which was delivered in London on November 22nd by Sir Frank Smith, secretary of the Department of Scientific and Industrial Research. The speaker said that mechanisation and an increased use of knowledge were essential; research would not only make our goods cheaper in terms of labour, but also more abundant. There might be marked dislocation of economic machinery, but there should be no brake on scientific and industrial progress.

Although the industrial research laboratory was becoming, to an ever-increasing extent, part of the industrial machine, there was with many industries far too much timidity and hesitation, and these must be overcome if this country was to regain much of her old-time supremacy in manufacture and export more manufactured goods.

Co-operative industrial research in this country was gaining ground rapidly, and over 5,000 firms were now connected with the twenty research associations initiated under the scheme set on foot by the Department of Scientific and Industrial Research in 1918. H.M. Inspector of Factories had recently carried out an investigation into the average size of factories. The investigation covered nearly 128,000 factories employing about five million workers. Fewer than 500 of the factories employed more than 1,000 workers each, and 117,147 factories employed less than 100 workers each.

This presented a problem not for industry alone, but also for the State. Few intelligent observers of the present industrial trend would deny that industry, like most other things, must progress or go to the wall, and with rapid changes in technique the small firm found many difficulties. It was well to urge that industrial firms should build research laboratories, but it was obvious that not one of the 117,147 firms could take an effective part in industrial research as an isolated unit. It was impossible for a small firm to maintain a laboratory with chemists, physicists, and engineers, though many of them should and did support a test room.

Sir Frank thought that there was too little pooling of knowledge in industry. There was good cause to keep certain information confidential, but this was carried too far.

The Proper Utilisation of Coal

AT the monthly luncheon of the COAL INDUSTRY SOCIETY at the Hotel Metropole, London, on November 21st, the recently appointed Director of the Coal Utilisation Council—Mr. W. R. Gordon—outlined the programme of investigation and research which the new organisation has in view for improving conditions generally in the coal trade. He indicated that there was first to be intensive research both as to market conditions and on the technical side, followed by propaganda, the latter depending upon the results of the market investigation.

Among the reasons for the Council's desire to survey the market before commencing the propaganda was the desire to find a common basis of propaganda which, while benefiting the coal trade to the utmost extent, would not conflict with certain other interdependent industries which, somewhat unnecessarily, had become alarmed at the recent formation of the Council.

Lord Gainford (President, Coal Industry Society), proposing a vote of thanks to Mr. Gordon, said that in endeavouring to develop the great coal industry of the country by means of the Coal Utilisation Council there was neither desire nor intention to work in antagonism with either the electrical or gas undertakings of the country. The coal industry wished to see these industries prosper as well as itself and to see them use more coal in the production of both gas and electricity. It was the desire of the Council to work cordially in co-operation with these other industries in an endeavour to help all three, because they were all "up against" imported oil. Therefore, he hoped that the gas and electrical industries and those concerned with the coal industry on all sides would do everything possible to secure the substitution of home fuel for imported fuel.

Single-phase Traction Motors

A survey of the developments in single-phase traction motor design is contained in a paper written by Mr. R. F. Stockar for the INTERNATIONAL CONGRESS OF ELECTRICITY in Paris. The first studies relating to main-line electrification were made before 1900, when only a.c. could be considered, as the use of d.c. at the voltages then permissible, would have necessitated too many feeding points. The single-phase system was eventually given preference, as affording the simplest solution. The easiest course was to use the same type of motor for single-phase as for d.c., namely, the series motor, which could not, however, be obtained to satisfy the requirements of traction work for the usual frequencies of 50 or 60 cycles, so a low frequency was adopted. Series motors were fitted on the first single-phase locomotive built, in 1905. This locomotive, which was designed by Dr. Behn-Eschenberg, of the Oerlikon Co., for electrification trials on the Seebach-Wettingen section of the Swiss Federal Railways, can be said to embody the principles which were later adopted generally. One of the principal factors that has influenced the developments of motor design has been the mode of mounting on the locomotive; the original arrangement with coupled axles has gradually given place to individual drive. The question of cooling has also played an important part, forced ventilation being now provided. Difficulties in the manufacture of the commutator have been successfully overcome, so that it can be claimed that a good modern single-phase traction motor is quite equal to a good d.c. traction motor.

A New Steam Engine

In a lecture delivered before the JUNIOR INSTITUTION OF ENGINEERS in London on November 18th, Mr. H. P. H. Anderson described a rotary steam engine of his invention which is of unusual design. There are concentric circular outer and inner casings. The revolving casing and cylinder block turn together, the interior piston heads extending outwards and being depressed inwards. Each piston head is fitted with a shoe which engages with track ring flanges, bearing directly on the inner diameter. An eight-cylinder engine with pistons 2¾ in. in diameter of 2 in. stroke, coupled directly to a dynamo of 80 per cent. efficiency, running at a speed of 923 r.p.m. with steam at 168 lb. superheated to 217 deg. C., produced 17.1 b.h.p. with a steam consumption of 17.2 lb. per h.p. non-condensing.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The I.E.E. Regulations

I should like to raise one or two general questions based on experience gained in the execution of duties involving the attempted enforcement of the I.E.E. (1927) Regulations.

It would appear that these regulations cannot be enforced unless they are specifically mentioned in the orders of the authority concerned, although there appears to be a loophole in asking the consumer to sign an agreement which clearly states that he (or she) is prepared to accept such rules as binding, but can this be upheld by the authority in a court of law?

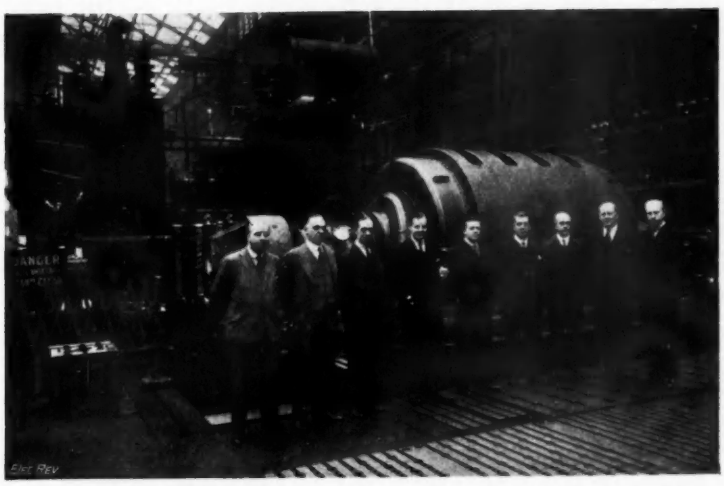
If enforced on the grounds of public safety, of what help are the following regulations? Rule 112(C) appears to allow a standard two-pin 5-A socket to be fixed in a ladies' hairdressing establishment—which is usually partitioned off and can (and does) have one socket per cubicle. Even assuming the portable metallic apparatus to have been provided with an earth lead by the manufacturer (which is rare!) one wonders what happens when the live lead wears bare just beyond the handle with the operator in close proximity to water taps or standing on one of those nice new composite floors which conduct electricity like water. Or is this covered by another rule of which I am ignorant?

Rule 111(B) limits a lampholder adaptor to a maximum current of 2 A. Manufacturers make (and supply authorities sell) 240-V 650-W bowl fires to work off the lighting circuits, and even larger apparatus has been so connected.

Rule 119(B) requires every motor exceeding ½ h.p. to be provided with (what is presumed to be) a no-volt release under clause (a). Within my limited experience not one of these safety devices has been seen, but perhaps they are general elsewhere.

I seek advice upon these everyday questions because so far I have not been offered a really satisfactory explanation of the points raised. I am getting rather tired of a certain class of contractor leaving an obviously unsatisfactory job which appears to be suitably covered by the existing "regulations," although so far as public safety is concerned the installation remains open to very grave criticism.

November 16th. CURIOUS.



A group of Metropolitan-Vickers officials (including Sir Felix Pole and Mr. W. C. Lusk) with the third 20,000-kVA synchronous rotary condenser which the company has produced for the Victoria Falls & Transvaal Power Co.

What are the Prospects?

I hope I may be forgiven for not being able to overlook a question in a recent issue of your estimable journal of particular interest to young entrants into the electrical field, *viz.*, What are the prospects? In an honest desire to give them good guidance I suggest they should try some other line for thirty years or so and defer the consideration until then.

Thirty years ago, after completing a college course, I entered on my apprenticeship with a well-known company whose name I was assured was one to conjure with. Later I found out the truth of that assertion and the necessity of conjuring to do anything with it. On the day I entered I was given a sort of tract entitled "A Message to Garcia" which described the loyalty and devotion of a young soldier with a despatch, who, after fearlessly passing through terrible privations and danger, arrived mortally wounded and in handing the despatch to General Garcia dropped dead. Unfortunately I did not read between the lines of the story correctly, and took for an example what should have been a warning.

Still there is a good chance of any unsupported young man becoming some day a door to door canvasser for vacuum cleaners or water softeners on terms that should suffice for his needs if he can supply 90 per cent. of them from another source. For any young man who values the companionship of the vast number of good-humoured, philosophic, broad-minded and capable fellows who do the useful and effective work there is some prospect of an interesting life in that sense, but little of contact with anything equally admirable or material profit.

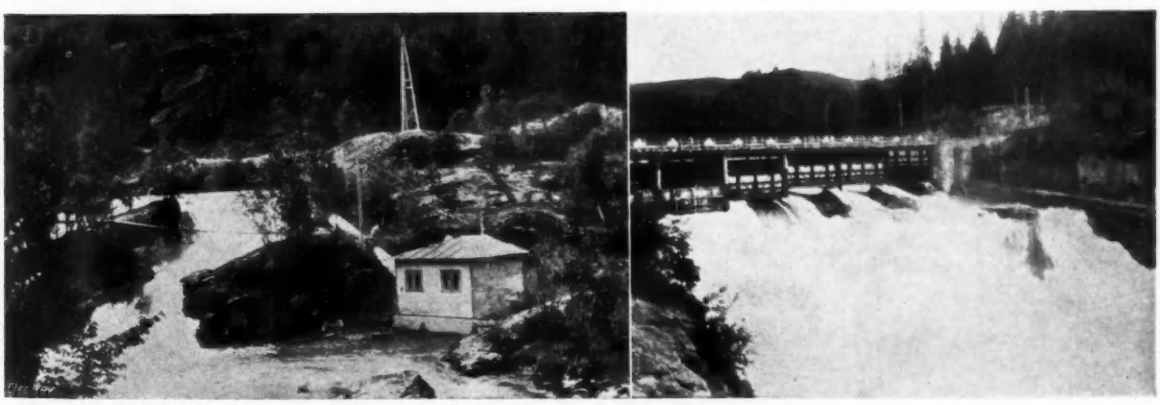
Undoubtedly there is much scientific progress yet to be seen, probably at the cost of better things, but there is also much business development which might be in progress to-day but is held back by discouraging conditions evidently designed to secure as much as possible for as little as maybe. Engineers serve the community unceasingly and acquire little but experience of their business and human nature.

Amersham, Bucks, *November 21st.* A. H. PALMER.

Double-tariff Prepayment Meters

I was naturally interested in the description which you gave of the B.I. double-tariff prepayment meter in your issue of November 18th, page 749. The statement in the last paragraph, that the principle of this type of meter had been considered in an article in your issue of October 7th, caused me to refer to the article by Mr. Parnall on page 495 of that issue. I find it to refer principally to the Metro-Vick prepayment meter, which provides a low price only during periods of high maximum demand, and a high price during periods of low demand.

The B.I. meter, of which I am the patentee, is based upon



Two Norwegian water-power undertakings: Left, a small hotel plant; right, a station supplying electricity to Trondhjem
(See page 789)

collection at a high rate until a certain fixed charge per quarter—based upon rateable value, floor area or other indicator of the consumer's maximum demand—has been covered; thereafter the gear ratio changes to a low rate. Unlike the other meter it provides a rebate for long hours of use of the lighting demand as well as for the consumer using relatively heavy domestic appliances.

Northwich, *November 21st.* W. FENNELL.

Insulator Reliability

Those who were unable to be present at the reading of Mr. Andersen's paper on the above subject will no doubt be interested in your report, and in the contribution which Mr. J. F. Shipley made to the discussion.

In spite of Mr. Andersen's remarks, however, porcelain is not the only material that can be applied successfully to e.h.p. overhead line insulators. During the past eight years at least, in different parts of the world, "Pyrex" brand heat-resistant glass has demonstrated its reliability for this purpose, and pin insulators manufactured of this material in this country have successfully passed all the usual tests applicable to porcelain insulators for e.h.p. overhead lines.

Moreover, with reference to Mr. Shipley's remarks concerning one-piece pin insulators, "Pyrex" insulators can be manufactured in one piece even for above 33-kV working voltage, and in fact to the maximum size and working voltage for which pin insulators can be economically utilised on overhead lines. Any possibility of internal cement troubles, usually associated with multi-part porcelain pin insulators, is thus entirely obviated. The insulators are also satisfactory with regard to resistance to thermal stresses.

Edgbaston, Birmingham, *November 19th.* M. W. SINGER.

Domestic Four-wire Services

Mr. Colin Pidd has stated his case so well that I am at a loss to reply. I certainly must admit that a four-wire service, under conditions of derangement, might give the unfortunate results suggested. Nevertheless, I have not heard of a domestic fatality between phases; whereas I can distinctly remember at least three cases of shock to earth proving fatal in recent times.

Domestic accidents are fortunately rare compared with the enormous number of connected consumers, but I still consider that matters could be improved by interesting the public in electrical safety.

Warrington, *November 13th.* N. S. BYERS.

[Owing to the occurrence of a printer's error this letter, which appeared in our last issue, is reprinted.—EDS. ELEC. REV.]

Our Diamond Jubilee

One of the most treasured electrical antiquities in our possession is a bound copy of Volume 1 of the ELECTRICAL REVIEW, dated 1872. A comparison of its contents with those in the present-day production provides a wonderful eye-opener as regards the widespread nature of modern electrical activities.

Your integrity and usefulness over such a long period are unquestioned, and carry with them the acknowledged appreciation of the profession and trade, whose interests have always been studied so thoroughly.

We are this year celebrating our own jubilee, and considering the value placed to-day upon "first editions," we are anticipating that the possession of the initial volume of the REVIEW will be a substantial asset when we celebrate our centenary.

We hope you will accept our hearty congratulations on the completion of your sixtieth year of such useful activity.

London, N.7, *November 18th.* A. P. LUNDBERG & SONS, LTD., Gus. C. Lundberg, *Director.*

Congratulations on sixty years. The ELECTRICAL REVIEW and I began about the same time, but it will outlast me.

Chichester, *November 18th.* J. W. MEARES.

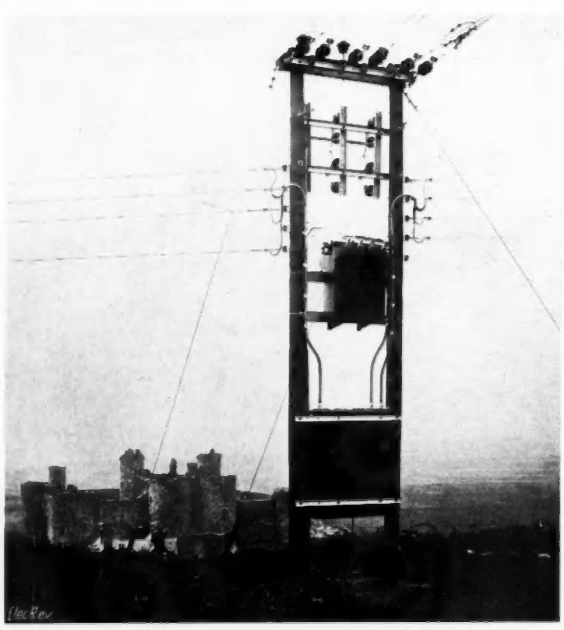
Thanks!

"Our congratulations are due to the ELECTRICAL REVIEW, which has just reached its sixtieth birthday—the first issue having been published on November 15th, 1872. Our contemporary has had a busy time in keeping pace, as it has done, with the industry with which it is identified."—*Gas Journal.*

Progress in the North Wales Area

THE North Wales and South Cheshire J.E.A. is responsible for an area of over 4,000 sq miles with a population of 800,000. Its statutory powers are exercised on its behalf by the North Wales Power Co. Electricity is generated at three water-power stations: Cwn Dyli, 5,500 kW, 9 million kWh p.a.; Dolgarrog, 10,000 kW, 40 million kWh p.a.; and Maentwrog, 18,000 kW, 35 million kWh p.a. The total installed capacity is thus 33,500 kW, with an output in a normal year of 84 million kWh. The Maentwrog station was started up in October, 1928; the others were in existence with 10,700 kW in 1923 when the J.E.A. was formed.

Three-phase 50-cycle a.c. is transmitted at 66 and 33 kV for main and 22, 11, and 6.6 kV for secondary lines. In 1923 the total route length of transmission lines in operation by the Power Co. was 110 miles. These have been increased to 570 (including 70 miles built by Electricity Distribution of North Wales and District, Ltd., a subsidiary company, which also has 187 route miles of low-voltage lines and cables).



Pole-transformer sub-station for the supply to Harlech Castle

Bulk supplies are now given to all of the seventeen authorised undertakings in the J.E.A. area, which take 22.7 million kWh at an average price of 1.13d., compared with the 1.06 million kWh sold to two undertakings in 1923 at an average price of 1.44d.; the reduction in price has thus been 21½ per cent., and further reductions are pending. In the same period the average price per kWh sold by the local authorities has been reduced from 5.1d. to 3.5d. per kWh, a reduction of 35 per cent. Another important consumer is the L.M.S. Railway shops at Crewe. Of the 65.4 million kKh (17,200 kW) sent out to the system in 1931, 4.79 million kWh was taken at 83 points by the Distribution Co., which sold 4.05 million kWh (33 per cent. increase over 1930) to 12,363 consumers with a connected load of 15,754 kW.

The company offers a two-part tariff, and hire-purchase of wiring and domestic apparatus in all parts of the area. Since the introduction of the hire scheme in 1930, 549 cookers and 545 kettles have been disposed of. Permanent showrooms are equipped in several centres and a travelling showroom is available for demonstration in outlying districts. Electricity is supplied for public lighting in twenty-one local authority areas. Supplies were made available in 1931 in the dairy-farming country between Nantwich and Oswestry, and by the end of the year 345 kW of lighting, 520 kW of heating, and 305 kW of industrial power had connected, the consumers including United Dairies, Ltd., and Trufood, Ltd. It is anticipated that supplementary supplies will be available next year from the 132-kV sub-station of the Central Electricity Board at Crewe.

Voltage Regulation on a Rotary

When the voltage ranges of a rotary convertor set are as wide as 6,000 to 6,600 V a.c. and 460 to 490 V d.c., and the maximum d.c. voltage is required with a minimum a.c. voltage and *vice versa*, an induction regulator is usually installed. Messrs. Crompton Parkinson, Ltd., inform us that they have enabled wide and smooth voltage regulation to be obtained in a recent equipment, inexpensively and without loss of efficiency, by fitting the transformer with their on-load tap-changing device. This arrangement gives step-by-step voltage variation, the regulation between steps being obtained by the shunt regulator.

New Apparatus and Devices

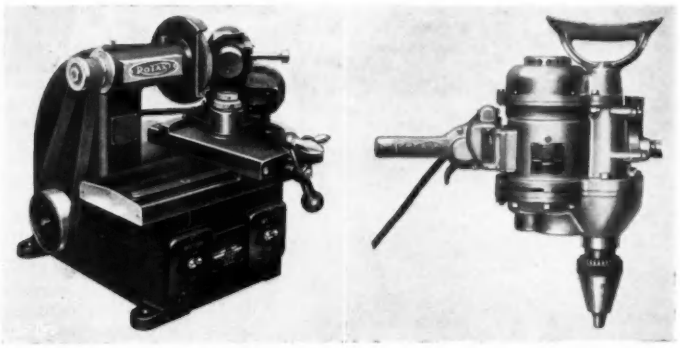
for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

"Rotax" Tools

A new range of electric tools developed by the Lucas, C.A.V., and Rotax organisation is being supplied by MESSRS. NEWTONS OF TAUNTON, LTD., 319, Regent Street, W.1. The new "Rotax" drills have been designed to combine maximum power and minimum weight consistent with reliability. Universal motors with dynamically balanced former-wound armatures are incorporated. The housings are of high-tensile aluminium alloy, and the gearing and other highly stressed parts are of hardened chrome-nickel steel. Special safety switches with trigger action are fitted to all models, the current being automatically cut off as soon as the operator's hand is released. A special locking device enables the switch to be held in the "on" position when the drill is used with a bench drill stand.

Another new tool is the "Rotax" ⅝-in. valve refacer employing a double-ended collet for holding the valve stems, the range with two sizes of collets being from ¼-in. to 11/16-in. diameter stems. Two motors are provided; the first, a ¼-h.p. constant-speed type, drives the ball-bearing wheel head by belt, and the second drives the work head, which is arranged to swivel 15 to 90 degrees by a graduated scale. The slides are of heavy construction and are self adjusting, ensuring uniformity of operation over a long period.

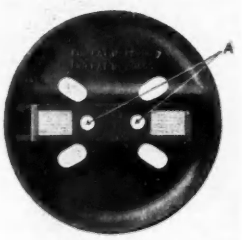
The ¼-in. standard drill (1,800 r.p.m. with no load) costs £7, and the ⅜-in. model (800 r.p.m. no load) costs £10. The valve refacer is priced at £32.



"Rotax" tools Left, a valve refacer, and, right, a ¼-in. heavy-duty drill

A "Bakelite" Switch Block

A "Bakelite" block has been developed by MESSRS. NEWEY & EYRE, LTD., 57, St. Paul's Square, Birmingham, to replace the wooden blocks used at present. It can be used for a one- or two-way switch, and is supplied ready drilled for mounting on the wall. The two screws holding the block to the wall pass through the countersunk holes A, while those fastening the switch to the block enter into the two wooden inserts in the cross piece of the block, and will take any standard switch. The conductors for the two-way switching are widely separated, being passed over the reinforced cross-piece *via* the two channels at either end. Two double-size knock-outs are provided in the side for use with surface wiring, and the price is not much more than that of wooden blocks.

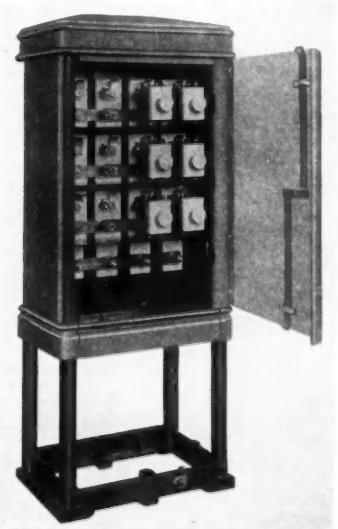


A rear view of the "Bakelite" block

A Unit Feeder Pillar

In order to reduce obstruction to a minimum, as well as for other reasons, it is desirable that feeder pillars should combine the largest possible capacity with the smallest dimensions. This feature has been the aim in designing the new unit feeder pillar manufactured by MESSRS. SIEMENS BROTHERS & CO., LTD., Woolwich, the height of the pillar above ground level being only 3 ft. 6 ins.

The compactness of design has been rendered possible by the use of cartridge fuses of high rupturing capacity (made by the English Electric Co., Ltd.), which are mounted in special porcelain handles as shown in the illustration. It will be noticed that the fuse handles are provided with spring clip contacts, and, to make permanent contact, provision is made for bolting the contact. Fuses up to 800 A can be fitted, and they are accommodated in a small handle so that there is no difficulty in operation on account of size.



The Siemens unit feeder pillar

The rupturing capacity of all sizes is guaranteed at 25,000 kVA and, despite the large current-carrying capacity of the larger sizes, there is the assurance of absolute safety whilst in service. The units are of the usual Siemens type, of cast iron, split along the cable centre, and fitted with heavy porcelain bases to carry the fittings. The mechanical properties of the pillar are such that it is claimed to be the strongest on the market.

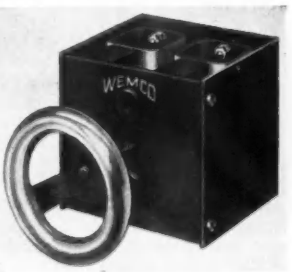
Heavy steel corner rods, which also act as hinge pins for the doors, are used for bolting foot and canopy together, while the end panels and doors are of sheet metal.

The "Wemco" Shunt Regulator

The shunt regulator or regulating resistance recently produced by the WALTERS ELECTRICAL MANUFACTURING CO., LTD., Kensaltown Works, Kensal Road, W.10, is of the back-of-board type operated from the front of the panel, a dial plate being supplied to show the direction of operation.

The chassis is of cast-iron and all live parts are protected by sheet-iron casing finished in black, while the insulated iron handwheel is nickel-plated. The resistance wire is wound on two tubes of non-metallic fireproof material, and it is claimed that it is impossible for the windings to become earthed.

The two contact brushes are of the shoe type and are concentrically driven; there is no lag between the driver and brushes, thus eliminating canting of the latter. Both the resistance units can easily be replaced on site. The regulators are arranged so that the turning of the handle in a clockwise direction cuts out the resistance, but by changing over one connection this can be reversed.



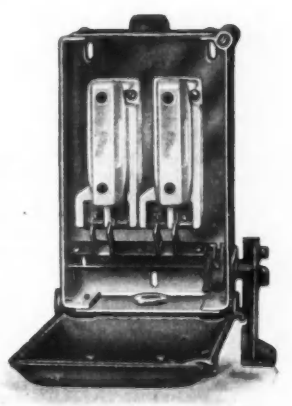
The "Wemco" shunt regulator

The price is 22s. 6d. with capacities from 2.5 A (max. current), 150 ohms, up to ¼ A, 2,880 ohms. The approximate weight of all models is 3¼ lb.

"Botrade Ultra" Switch Fuses

A recent development by MESSRS. S. BILL, LTD., Queen's Road, Aston, Birmingham, is three new switches. The "Ultra 10" is a "Botrade" switch and switch-fuse rated at 10 A, 250 V, and is a successor to the "Botrade" 10-A switch-fuse. The switch and fuse contacts are mounted on vitreous china, the company's arc damping fuses are embodied, and the wiring passages are straight and clean, the brush bar being lifted well above the incoming cables. The double-pole switch is priced at 3s., or 4s. with fuse.

The 30-A model is suitable for domestic heating loads, and also has a "Q" type q.m. and b. switch. The brush bar insulation is of hydraulically compressed "Bakelite," the brushes being clamped to this to give a practically immovable mounting. The terminal blocks are secured



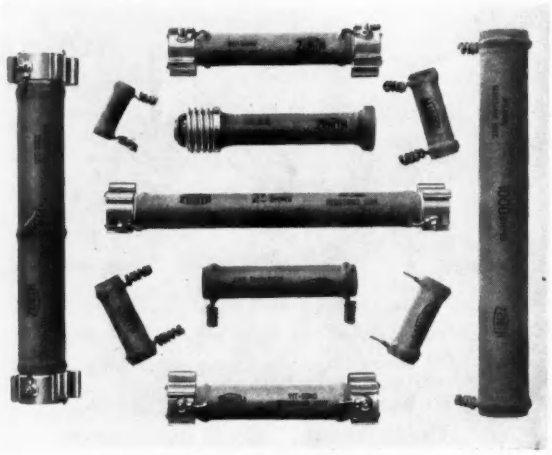
The "Botrade Ultra" 30-A switch-fuse

by two fixing screws to prevent the blocks from turning when the cable screws are being adjusted. Detachable conduit plates with 1-in. bushed holes are fitted to the top and bottom of the switch-fuse. The double-pole switch costs 5s. (with fuses 9s. 8d.), and the triple pole switch 9s. 8d. (with fuses 14s. 8d.).

The "Botrade Ultra 15" ironclad switch splitter is also a newcomer. It is designed for house mains, and is made on the specification of the "Ultra 10," controlling two 5/10-A double-pole fuse-ways. The price is 6s.

"Vit-Bond" Resistance Units

The "Vit-Bond" resistance unit made by the ZENITH ELECTRIC CO., LTD., Villiers Road, Willesden Green, N.W.2, is a heat-resisting porcelain tube which carries the resistance wire



A range of "Vit-Bond" resistance units

embedded in a special vitreous material designed to protect the wire from external influences without "crazing" and to withstand higher temperatures than ordinary vitreous enamel.

The resistance is made as accurately as possible by a process that should ensure that each individual turn is retained in position, thus avoiding creeping and strain, and preventing any risk of the wires touching and causing local overheating with its inevitable results.

The units can be wound to any ohmic value to suit customers' requirements, and additional tappings can be provided in the form of copper tails, bands, or tags. As more space is required where there are many tappings it is sometimes necessary to employ a somewhat larger size of unit to obtain the same ohmic resistance as is otherwise available with a smaller type.

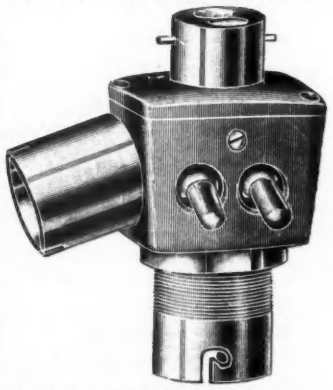
The ohmic values are guaranteed within an error of plus or minus two per cent. on the total and plus or minus eight per cent. between the tappings. An accuracy of one per cent. can be obtained to special order. There are several models, ranging in price from 2s. 4d. to 17s. 4d.

A Two-way Adaptor

With the standard type of two-way lampholder adaptor, embodying only one switch, there is always difficulty in using the heat adaptor when the light is needed because it is only possible to turn off the light or both light and heat.

The new adaptor, which has just been brought out by MR. E. KRAMRISCH, 72, Oxford Street, W.1, enables each to be controlled independently by two q.m. and b. switches. It is finished in "Bakelite" and can only be supplied to wholesalers and factors.

The price has not yet been settled, but such a fitting should find a ready market in every home where an iron, immersion heater or other small apparatus not embodying a switch is used.



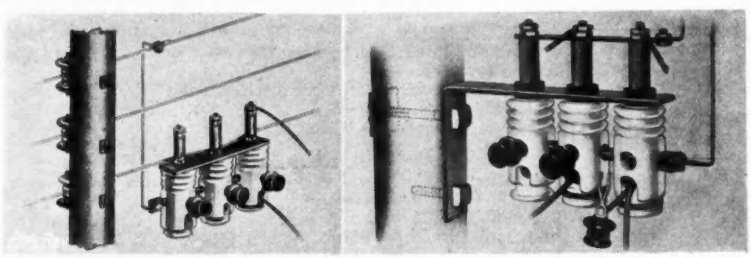
The "Kramrisch" two-way adaptor

Post Nippers

One of the latest products to be introduced by MESSRS. FREDERICK J. GORDON & CO., LTD., 92, Charlotte Street, W.1, is a post nipping tool. This has been designed for cutting pillar posts and trimming lead parts, and has a handle 24 in. long giving powerful leverage. The tool is steel tempered and costs 12s. 6d.

A Simple Line Tap

FOR making house-service connections to overhead distribution systems skilled labour only has hitherto been employed, because such work involves either interrupting the service or handling live wires, and the service wires must also be normally bound to the insulators. The general practice is to tap both phase and neutral wires for each individual service, providing separate insulators and fittings for each wire.



Left: On a neutral wire. Right: The tap fixed to a wooden pole

This procedure is inconvenient and the service connection often unsightly, but both can be avoided by the use of a new distributor introduced by Bullers, Ltd., which is so designed as to necessitate only one line tap and yet provide for multiple house connections.

The principle is permanent connection to the line, accomplished with the aid of a bus-bar device, individual service connections being made off as and when required by means of insulated spring plugs. These fittings eliminate the use of binding wire.

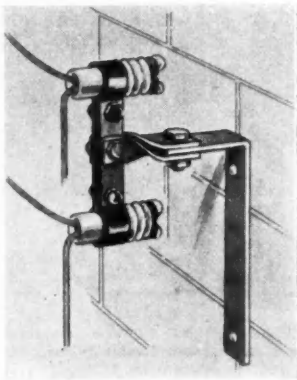
A groove is provided in the insulator which communicates by means of a slot with a through hole. A loop of the wire is passed through the hole, bent round the groove, and drawn back, thus effectively anchoring the wire to the insulator and at the same time obviating the need for binding and expert labour.

The distributor is available in three types: for direct attachment (in suspension) to the neutral conductor, the simplest and most economical method, and for bracket mounting on wood and steel poles.

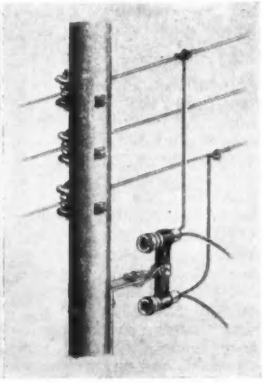
Once these distributors are installed little time is needed to tap off service connections; they can be attached to any existing system and may even be installed at potential service points when the overhead lines are erected, at little extra cost. They provide equal facility for disconnecting house services when required, without handling live wires, by merely withdrawing the insulated spring plugs.

Multiple house end fittings are a simple means of securing the wires to the house itself on a suitable wall bracket. The wires are looped in, in the manner previously described, without binding wires and then carried down to the leading-in tube. These end fittings are also adaptable for pole mounting when the distributors are not appropriate, affording extra service connections without interfering with the single pole attachment in any way.

All the porcelain and galvanised metal fittings used are made by the company itself. The standard finish is brown glazed, but the company is in a position to supply white, grey or green finishes, according to requirements.



House-end fitting



Fitting without shackles

Overheard ! By "Listener"

A dialogue for an E.D.A. platform

JONES: Lot about sales in the REVIEW lately.

Smith: Very necessary, too.

J.: Yes, perhaps so, but we are engineers, not drummers.

S.: Dangerous attitude, old chap. Just playing the other fellow's game. After all, we built up the supply business to what it is, and we don't want some clerical Johnny to jump our claim.

J.: No chance of that; they could not do without us to manage our respective shows for them.

S.: Don't you be too sure about the management part of it, although probably they'll always want us to keep juice on the line and look after the mains.

J.: Yes; but what about handling power consumers: records, meter reading, statistics, and all that?

S.: I'll bet your Town Clerk and our secretary think they could do the job just as well as you or I. You must remember the supply business has become worth grabbing.

J.: But they have their own work to do.

S.: Quite true, but if they take responsibility for some of our work, up go their screws!

J.: Why, our Town Clerk gets more than I do now.

S.: Just so; but he won't object to a bit more.

J.: Well, what are you getting at? Have we got to put up with it or can we block it?

S.: We can block it up all right, but not if engineers are fools enough to keep on saying that "selling isn't an engineer's job; an engineer is temperamentally unsuited for it," and all that rot.

J.: But don't you think a lot of engineers are poor salesmen?

S.: Undoubtedly; but that is no reason why a lot of them should remain so. Lots of them are too confoundedly stuck up to study the job, and the rest don't think it's worth while.

J.: Well, is it worth while?

S.: I'll tell you this. If we don't think it's worth while, someone else will, and it will be good-bye to any further increases in our salaries; in fact, if our salaries aren't cut, it's a moral certainty that our successors won't get half what we draw.

J.: Yes, but we shan't be here then.

S.: Don't you think that's a bit selfish? We expect loyalty from our staffs; well, we have a duty towards them too. Anyway, we can do the job as well, perhaps a bit better, than the other fellow; then why let him have it?

J.: Of course, they'll say that commercial development should be in the hands of a business man.

S.: What is a business man?

J.: That's what I've never been able to find out.

S.: I'll tell you—a man with heart and conscience in a state of suspended animation.

J.: Not bad, but what do you advise?

S.: Realise that selling juice to a few thousand more cookers and water heaters matters a lot more than spending umpteen thousands to save a few hundredweights of coal and paying away more than we save, in a dole, to keep a poor devil of a fireman sitting on his doorstep waiting for a job.

J.: Come, I say! that's heresy. How can we get the big power consumer, who has an efficient power plant of his own, if we don't cut our works costs to the last .001d.?

S.: I'm heretic enough to say that very often we'd be better off without him, and that half the time other consumers have to carry him.

J.: Better not let your views reach the grid people!

S.: You'll know all you want to know about the grid before you're through. In the meantime look after the small and medium-sized consumers and cultivate the domestic load.

J.: Do you mean I've got to get down on my bally knees and play at building castles with lamp cartons in the showroom window?

S.: No, not quite so bad as that, but you'll have to alter your organisation a bit and pay your chief sales assistant enough to show your people that you appreciate the importance of the sales side and give him his proper place on your staff.

J.: What do you mean by "his proper place"?

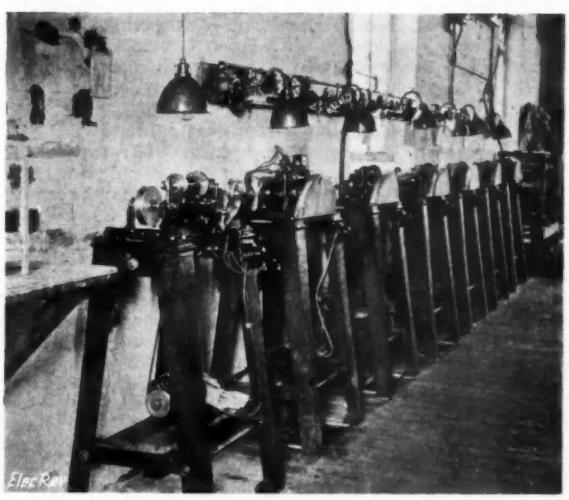
S.: Make him directly responsible to you for his department. How can we expect a man to swing enough weight with a potentially important consumer, when he's about a sixth-grade man, wearing reach-me-downs and a worried look, because he scarcely knows how he's going to pay his rent?

J.: But can you get the kind of man you want for a senior job like that?

S.: Yes; there are a few knocking about, and I'll tell you this—once we show there are prospects in sales work, a whole crowd of smart young shift engineers will start correspondence classes in salesmanship and psychology. We've got the stuff all right; latent—only wants training.

J.: I'm not quite so sure as you are about making engineers into salesmen.

S.: You needn't doubt it. A friend of mine said the other day that the reason we'd lost so much of our Dominion trade to America, Germany, and other countries was that they send out engineers trained as salesmen to sell their plant, while as often as not English firms employ an office chap, who can't give you a blessed detail that matters. If foreigners can turn their engineers into salesmen, I guess we can.



Filament spiralising machines at the Ensign Lamp Works **(See page 778)**

J.: It's going to send up our costs.

S.: It's going to make our balance sheet look better. A good salesman can earn his keep, if you give him enough rope. Anyway, cheapness isn't everything. When you and I started in the game it wasn't much good talking about cheapness; we had to talk about convenience, cleanliness, and that sort of thing. You and I had to be salesmen in those days, my boy!

J.: Yes; I'm afraid we've become a bit mercenary: chasing the almighty dollar and that sort of thing. Ideals have become rather flabby.

S.: A bit too much "bithness ith bithness" about it nowadays. We are inclined to forget our pride in having the grandest thing in the world to sell—the force which makes for better living conditions in the factory and the home and on the farm.

J.: True enough! Must be toddling now. I'll think about that sales business. I believe you're right!

The Dnieprostroi Hydro-electric Works

THE formal opening, on October 10th, of the first stage of the Dniepr State hydro-electric station, the most spectacular and important achievement of the five-year plan (ELECTRICAL REVIEW, September 16th, 1932), was celebrated in the presence of members of the Government, delegations from all parts of the country, and guests from abroad. To mark the completion of the first stage before the appointed date, the Government has conferred the highest decoration of the country on many engineers and workmen, as well as on Col. H. Cooper, the American consulting engineer, and other foreign engineers connected with this scheme.

All the concrete work and the buildings have been completed for the ultimate capacity of the station. Five generating units of 84,000 h.p. each have been put into commission. The turbine of the sixth set has been erected, and the alternator, manufactured at the "Electrosila" works in Leningrad, is being erected now. The remaining three turbines are also being erected; their alternators, too, are being manufactured at the "Electrosila" works. At the main sub-station, the transformers, oil switches, &c., for the five units have been completely erected.

Two double-circuit 160-kV lines to Dniepropetrovsk and a single-circuit 160-kV line from Dniepropetrovsk to Kamenskoe have been completed; 120,000 kW of transformers with the requisite switchgear have been installed at the various sub-stations. It is anticipated that by the end of the current year four other 160-kV lines will be ready, over which it will be possible to transmit 400,000 kW, *i.e.*, the maximum capacity of the first stage after the installation of the Stoney type gates.

At present the head of water is 92 ft. At this head the five sets could develop about 200,000 kW, but the various works of the industrial combine are not yet ready to use the full output. The forty-eight Stoney type gates, of welded construction, have just been completed at the works in Nikolaev, and it is anticipated that they will be installed by the beginning of navigation in 1933.

The construction of this undertaking has been carried out by Russians in consultation with American engineers. The personnel, which was specially trained, and the mechanical equipment are now being transferred to the construction of the three hydro-electric stations on the River Volga, which is an even more ambitious scheme than Dnieprostroi.

The Cardiff Engineering Exhibition

MANY items of electrical interest are again included in this year's Engineering Exhibition at the Drill Hall, Cardiff, arranged by the South Wales Institute of Engineers. The show opened on Wednesday and it will run until December 3rd.

The display of the Leeds Meter Co., Ltd., includes the "Helix" boiler feed meter, which may be fixed in horizontal, vertical, or inclined positions. The frictional loss of head on the meter is negligible. In the interchangeable mechanism type meter the mechanism can be removed intact for inspection, cleaning, &c., and by the use of a blank flange bolted to the body, the service can be restored in a few minutes without disconnecting the meter from the main. The "Leeds" rotary meter is suitable for process work, departmental costs, domestic supplies, &c. It is sensitive to very small flows and has a large delivery capacity.

Tangyes, Ltd., are exhibiting several types of pumps, including a vertical treble-ram pump arranged for electric drive, a horizontal "Duplex" boiler feeder, and several examples of "Tangyro" centrifugal pumps, as well as a new cold-starting vertical crude-oil engine. The Carrier Engineering Co., Ltd., shows a model of the "Carrier-Owen" plate-type air preheater as applied to water-tube, Lancashire and marine boilers, which serves to demonstrate the accessibility of the equipment.

Lamps and Lamp-room Equipment

The exhibits of Oldham & Son, Ltd., include a comprehensive range of miners' electric safety lamps and lamproom equipment. The 4-V hewers' lamp gives three times the candle-power of the existing 2-V lamps, and the new "Super 4-V" lamp weighs just under 9½ lb. There is also a new pony lamp and a representative range of officials' lamps.

The Concordia Electric Safety Lamp Co., Ltd., is exhibiting its high candle-power colliers' lamp, together with a full range of lamp-room equipment, including a charging stand and switchboard, a lamp rack and a magnet opener.

Ceag, Ltd., have a comprehensive range of high candle-power lamps fitted with alkaline and 4-V batteries for both hand and cap. The new patent 4-V battery, interchangeable with the existing 2-V type, is exhibited in section. Tests may be made with a new portable photometer in a dark-room. Gent & Co., Ltd., again put forward "Tangent" flame-proof bells, telephones, relays, &c., "Pul-Syn-Etic" electric clocks and time discipline apparatus, and "Electro-matic" synchronous clocks and radio apparatus. G. A. Harvey & Co. (London), Ltd., show "Harco" gilled tubes for heating, electrical, and refrigeration work.

The stand of British Insulated Cables, Ltd., bears examples of mining cables and boxes, ebonite sheathed and colliery lighting systems, electricity meters, including a new double-tariff meter, electric welders, static condensers for power factor improvement, radio and telephone condensers, paper pinions, and extruded sections in aluminium and copper.

British Ropes, Ltd., are showing ropes of all types for winding, guides, overhead ropeways, &c., and overhead-line conductors as supplied to the Central Electricity Board.

Boiler Plant and Accessories

Babcock & Wilcox, Ltd., show a chain-grate stoker in which the air for combustion passes through the lower run of the chain before entering the compartments, and the rear end of the grate is stepped downwards to facilitate clinker and ash removal. "Babcock-Tate" electrical control gear is also displayed.

Among the products of companies associated with International Combustion, Ltd., displayed on the stand of G. S. Mottram and Partners, Ltd., are a section of the "Usco" louvre travelling grate stoker; a sectional model of the "Usco" air preheater; a forced-draught front and "Lindsay" turbulator for improving the efficiency and eliminating the smoke nuisance in Lancashire boiler plants; "Lopulco" industrial pulverised-fuel fired boiler plant; a "Robot" stoker for domestic heating boilers fitted to a typical boiler, and various types of castings for stokers, boilers, and general engineering requirements.

George Kent, Ltd., are exhibiting meters for boiler feeds and condensates, a shunt steam meter which provides an inexpensive and easy way of metering small mains (if desired groups of steam meters may be mounted on steel panels, and records can be transmitted electrically to some central point by means of "Kent" telerecorders); and air meters for compressed air installations and for measuring low pressure supplies. The Enfield Cable Works, Ltd., is showing specimens of various types of cables. Small haulages for inbye working exhibited by M. B. Wild & Co., Ltd., are suitable for either electric or compressed-air drives.

Switchgear Exhibits

The South Wales Power Company's exhibit takes the form of an information bureau with some excellent examples of modern lighting. Electrical trackless hare equipment, samples of coils used in repairing electrical machinery, and components of industrial electrical equipment are being shown by McWhirter & Sons, Ltd. On the stand of Haslam & Stretton, Ltd., may be seen flame-proof mining-type switchgear made by A. Reyrolle & Co., Ltd., special apparatus for the descaling of boiler and condenser tubes produced by Flexotube (Liverpool), Ltd., and examples of Evershed & Vignoles's testing instruments. As in previous years, Film Cooling Towers (1925), Ltd., exhibit a working model of a small section of their film cooling tower and a small model of their recently patented "Concerte" cooling tower. The Association of Mining Electrical Engineers (South Wales Branch) is responsible for an information bureau in which publications of the Association are available. The New Engineering Construction Co., Ltd., has on show "Ovalock" open steel flooring, suitable for engine rooms, condenser pits, &c.

Heyes & Co., Ltd., have on view a new flame-proof lighting fitting for use in pentane-air mixtures and the "Wigan" battery exploder and typical samples of the company's flame-proof switchgear and signalling equipment are also being displayed. The Lauritzen treatment for boiler feed water demonstrated by Mr. H. Lauritzen is essentially that of introducing with the feed water a small and regulated quantity of a high-grade colloid which causes all scale-forming substances to precipitate and form a sludge which can easily be blown or scummed out.

Examples of products of Paxtons (Cardiff), Ltd., are contacts for controllers for tramways, electric railways, cranes, colliery haulages, &c., and also for switchboards and switch interiors.

"Ilo" lubricating oils and greases are to be seen on the stand of W. B. Dick & Co., Ltd. On the stand of Tom Smith and Clarke, Ltd., the Turbine Furnace Co., Ltd., is showing the "Turbine" forced-draught grate, with both steam jets and with fan-draught air supply; the Central Electrical Engineering Works, Bristol, displays reconditioned electrical machines representative of one of the largest stocks of second-hand electrical plant in the country; and Matterson, Ltd., have a working exhibit of a standard one-ton electrically operated hoist. The stand of the Cardiff Corporation Electricity Department is mainly an information bureau, but there are exhibited a number of electrically operated articles.

An electric propeller fan, forge blower and paddle blade fan are included in the exhibit of Matthews & Yates, Ltd. New lines of manufacture shown by Allen West & Co., Ltd., include overhead-line equipments for up to 132,000 V and carbon tetrachloride liquid fuses suitable for varying voltages up to 132,000. Two switchboards comprising vertical draw-out, oil-immersed circuit breakers for 11,000 V are also shown.

Mine Motors

Among the exhibits of the General Electric Co., Ltd., are a 75-h.p. live roller motor with great mechanical and small rotational inertia for rapid acceleration; a 25-h.p. underground haulage motor with a drip-proof frame and a flame-proof slip-ring cover; a new 10-h.p. flame-proof direct-to-line contactor starter of exceptional strength to withstand any internal explosion with safety; and a flame-proof lighting transformer unit suitable for operating in fiery mines.

Of particular interest among the exhibits of Lancashire Dynamo & Crypto, Ltd., are a 10-h.p. flame-proof barrel-type mining motor, dismantled, with a special cartridge bearing which prevents the entry of dirt, &c.; a 3-b.h.p. flame-proof barrel-type mining motor with a flame-proof plug; a 35-b.h.p. 720 r.p.m., flame-proof "Tefco" s.r. motor designed for 3,000/3,300 V; a "Tefco" 16-h.p. s.c. motor shown running to demonstrate the air flow between the inner and outer stator cases; a 50-h.p. s.r. motor with external slip-rings protected by a flame-proof enclosure; a 15-h.p. heavy duty double reduction type unit, 960 to 48 r.p.m.; a Crypto-Langham geared motor unit dismantled; and many smaller products.

The E.L.M.A. at Selfridges.

An effective window lighting demonstration has been arranged at Selfridge's, Oxford Street, W., by the Lighting Service Bureau. This represents an attempt to evolve a new type of lighting which relies to a great extent on showing the goods in silhouette, instead of the usual method of lighting the goods themselves against a less striking background. Another object of the experiment is to ascertain whether a change of colour of the background could be matched with a change of merchandise. It would appear from these tests that the method employed will materially extend the range and variety of lighting effects and thus improve the sales value of the displays.

Water Power in Norway

THE Scandinavian Peninsula consists of a mountain mass sloping steeply down to the sea on the Norwegian side and with a much easier slope towards the north-east Baltic on the Swedish side. There is a series of high table lands in Norway, some of them covered with glaciers, and as the land drops down very steeply to the Atlantic there are numerous points at which water power has been or could be developed. Two typical undertakings are illustrated on page 783.

The first illustration shows a little d.c. power station with an output of a few kilowatts and a wooden pressure pipe; this supplies electricity to a hotel placed not many yards from the trees seen on the left of the picture.

Many hotels in Norway are closed to visitors in winter, and some of them are completely isolated by snow, except for those which can be reached on skis; a few are open, for winter sports, where communications are open as around Oslo. In the very long nights in Northern latitudes a good light facilitates the making of those embroideries, mats, &c., which are such a feature of Scandinavian village industry. Those who go on Norway cruises can hardly help noticing the overhead lines which supply so many villages. The telephone, also, is comparatively cheap in Scandinavia, and for the farmer telephone communication, with numerous trunk calls, is looked upon as a necessity—not as a luxury, as with us. The second picture shows the sluices of a hydraulic station outside Trondhjem, which supplies the city, and also a single-phase standard-gauge railway with power. Some authorities have estimated the potential hydraulic power in Norway as over ten million horse power. The absence of native coal makes such developments very valuable, although the comparatively light traffic on the railway accentuated by road competition makes general railway electrification a difficult matter economically.

In the Courts

IN the King's Bench Division on November 17th Mr. Justice Langton had before him an action brought by N. V. "Splendor" Gloeilampenfabrieken, Holland, to recover from the Omega Lamp Works, Ltd., Wimbledon, £500 which the plaintiffs alleged was due to them under a licence dated December 5th, 1927, for royalties. The plaintiffs are the registered proprietors of English Patent No. 267448, of 1926, for an invention relating to improvements in so-called tipless incandescent lamp bulbs and the like sealed envelopes and in December, 1927, the plaintiffs and the defendants entered into a deed by which, in consideration of the royalties thereby reserved, the plaintiffs gave the defendants licence to make and sell electric lamps under the patent within the United Kingdom.

The plaintiffs' case was that the defendants had broken their covenant to keep accounts of all matters connected with the licence, and had not paid to plaintiffs the £500 claimed for royalties they alleged to be due, and had failed to deliver particulars in writing of the number of lamps, bulbs, &c., manufactured and sold by or on behalf of the defendants.

The defendants denied any breach of the agreement. They said that the plaintiffs well knew that no lamps under the licence were manufactured by defendants during the period in question and therefore that the defendants were under no obligation to render the particulars. They further said that in May, 1929, they discovered an infringement, or threatened infringement, of the letters patent by the Nelson Electric Co., Ltd., and they gave notice to the plaintiffs of that, yet the plaintiffs did not within six weeks of the notice, as provided for in the agreement, take any steps to prevent infringement. The defendants contended that in those circumstances the licence became determined and they were relieved from all further obligation to pay royalties.

The defendants further alleged that the plaintiffs had failed under a clause of the agreement to communicate to them any improvements they made or discovered with respect to the method of exhaustion of the tipless lamps, and had thereby repudiated the agreement.

The plaintiffs denied that they had committed any breaches of the agreement and that in the circumstances there had been a breach by the defendants to pay a royalty of a half-penny for every lamp or bulb manufactured by them, with a minimum annual payment of £500.

At the close of the evidence for the plaintiffs on November 18th the further hearing was adjourned for a few days.

The Radiovisor Litigation Judgment

In the King's Bench Division on Saturday last Mr. Justice Lawrence delivered his reserved judgment in the action by Radiovisor Foreign & Colonial, Ltd., against Radiovisor Parent, Ltd., claiming £200,000 damages and the return of 100,000 £1 shares. The claim was based on misrepresentation when the defendants sold plaintiffs the foreign rights in a selenium light bridge; the defendants denied both misrepresentation and damage.

His Lordship said that the selenium bridge in question was patented in 1927 and 1928. Amongst other things the bridge could be used for the control of street lamps. It was found that it was of commercial value and Mr. Neale, the inventor, interested Col. Murray in it, and Mr. Avern, who lived at Barnes. Mr. Avern got into touch with the Barnes Urban District Council, who gave the bridge a trial on lamps at Barnes. The results of the trials were quite satisfactory and the Council intimated that it was willing to consider its adoption on a large scale.

The Parent Co. was then formed with a capital of about a quarter of a million pounds. Then the plaintiff company was formed with the Duke of Atholl as chairman, and they entered into the agreement that was the foundation of the action. Later there were interviews between representatives of the plaintiff company and the defendant company, but no mention was made of misrepresentation at that meeting. Mr. Swinburne was interested in the matter. Two years after the alleged misrepresentation Mr. Terrell said he informed the Duke of Atholl of the charges he was making, but the Duke said he only heard of it just before the action. Mr. Terrell said he informed Mr. Swinburne as well. Heavy onus was laid upon the plaintiffs in this case. The trial had lasted forty days. The question was whether upon the evidence he was satisfied that the allegations brought had been made out. His Lordship attached great importance to the fact that Mr. Swinburne had not been called, as his evidence would have been of great importance in the matter. In his view the correspondence showed that the bridge was fit to take its place in the commercial world and this was apparent from demonstration.

He found that the statement was true and that the bridge had such constancy as alleged. When an inventor said his invention was fit for the world, he was only saying that it was fit to be adopted. It had not been shown that it was not fit to be used commercially in 1929. Defendants, he thought, honestly believed that the bridge was fit for use and that there was no concealment of facts. He found that there was no fraud in making representations as to the constancy of resistance.

Next came the alleged misrepresentation that the bridge would only cost a few shillings to manufacture. In his Lordship's view nothing more was represented than that the bridge could be manufactured in large quantities, which was intended to mean that when the factories were ready the manufacture in large quantities could be effected. After reviewing the evidence his Lordship said he came to the conclusion that the allegations of fraud had not been made out. The invention was a novelty, technically, and a marvellous one. He entered judgment for the defendants with costs.

Parliamentary News (BY OUR SPECIAL REPORTER)

THE first Session of this Parliament came to an end on Thursday last week when Parliament was prorogued. The new session commenced on Tuesday, when Parliament was opened by H.M. the King.

Electricity in Mine Stables

On November 16th Sir Robert Gower asked the Secretary for Mines if he could state the number of underground stables, and the number of mines at which they were electrically lighted; and whether there were serious technical difficulties in the way of electrically lighting all underground stables.

Mr. E. Brown replied that he could not say in how many cases the stables were lighted electrically. In those mines in which electric power was available in the vicinity of the stables it should not be difficult and electric lighting was certainly desirable wherever it was safe and practicable.

The Central Board and Sir R. Blomfield

On November 16th Mr. Perkins asked the Minister of Transport whether he would state the total sum paid by his department and the Electricity Commissioners to Sir Reginald Blomfield, R.A. for the last three years.

Mr. Pybus said he could not find that any payments had been made to Sir Reginald Blomfield, either by his Department in connection with electrical matters or by the Electricity Commissioners during the last three years. Sir Reginald was retained by the Central Electricity Board to advise them in matters of landscape and architecture but he was not aware of the fee he was paid.

Brimsdown Power Station

On November 17th Lieutenant-Colonel Applin asked the Minister of Health if he would state what steps, if any, had been taken to redress the grievance of the residents of Eastern Enfield who had petitioned against the nuisance caused by grit and filth ejected by the power station of the North Metropolitan Electric Power Supply Company at Brimsdown; and whether he was aware of the damage done to property and health by this nuisance.

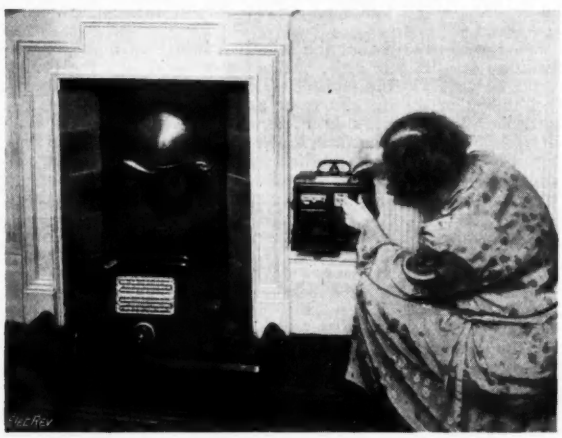
Mr. Shakespeare, who replied, said that the minister was informed that the company did not admit that there was a nuisance but had installed plant to reduce any possible cause for complaint, and that still further improvements were being made.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources, Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

E.D.A. Activities

Following the launching of its Hotel Lighting Campaign, the British Electrical Development Association is now actively engaged in a campaign for the heating of hotel bedrooms, and in this connection has produced an attractive booklet entitled "The Warm Welcome That Pays," in which it shows that the introduction of electric fires in hotel bedrooms adds to the popularity of the hotel, and that the installation quickly pays for itself, reducing the cost of redecorations and maintaining soft furnishings in a fresh condition. Attention is drawn to the "shilling-in-the-slot" meters which electrical manufacturers have produced, and to the many different designs of fires which are available. Reference is made to other methods of electric heating, such as the tubular and panel systems, while the advantages obtained by the installation of electric water heaters are also touched upon. The booklet, which has been sent to 10,000 hotels, is profusely illustrated; one of the illustrations, showing a slot meter fire in a bedroom at the Strand Palace Hotel, is reproduced with these notes.



A slot-meter fire in a Strand Palace Hotel bedroom

A further booklet in connection with the campaign has been prepared entitled "Hints on Getting the Business" (E.D.A. 1076), in which information and guidance is given to electrical salesmen in persuading hotel proprietors to heat their bedrooms electrically.

In the Association's programme for November and December considerable space is devoted to the hotel bedroom heating campaign. Particulars of the procedure which is being followed are given and of the advertising arrangements for November, December and January. The greater part of the remainder of the programme is confined to the Christmas trade and four special window displays are illustrated.

The Association has now issued the programme of conferences for the London area for 1932-33, all of which are being held at the Caxton Hall, Westminster, S.W., commencing at 7.30 p.m. To-day (Friday) two anonymous papers are being presented on "Electric Cookery Development," while the other dates are: January 20th: "Selling Demonstrations," by Mr. W. Attwood; February 17th: "Water Heating," by Mr. P. C. Honey; and March 17th: National finals in the E.D.A. Public Speaking Competition.

Cutting Oils

Skin trouble is sometimes experienced by workmen using soluble and cutting oils. To overcome this, Sternol, Ltd., has produced two varieties of oil constituted as follows:—Supercut soluble oil (for cutting, screwing, grinding, milling, and turning)—water 7.42 per cent., unsaponifiable oil 64.61 per cent., saponifiable oil 27.39 per cent., Na_2O 0.58 per cent.; and blended "Tapoyl" (No. 8100)—unsaponifiable oil 80.82 per cent., saponifiable oil 18.83 per cent., phenols, cresols, &c., 0.35 per cent. The former is diluted with water to the extent of twenty parts to one; the latter is used at full strength. The Institute of Hygiene has awarded its certificate for both oils as harmless to those who may come into contact with them when engaged on the above operations.

Sir Felix Pole's Optimism

Speaking at a Rotary Club gathering last week Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., expressed the view that the world was now reaching the end of what had been a "painfully long lane." There had been previous periods in our history when things had seemed irretrievably bad but the pessimists had been strikingly confuted by events. What were we to do, he asked, to make up for our lost position as the world's industrial leader? Exports were most important of course; in this direction much more trade might be done with Russia which was now possessed by a desire to be electrified, mechanised, and developed. But more than ever before we must concentrate on our home trade and upon our agricultural industry. By adopting modern methods of production agriculture could be made attractive and profitable. What steam had accomplished a century ago electrification could achieve to-day. He had no doubt about the success of the grid and that it would bring vast and beneficial results to industry and the country generally—especially the countryside.

Garage Electrical Equipment

In our issue of November 11th (p. 726) we published under this heading some notes on the new Knightswood garage of the Glasgow Corporation. Messrs. Bastian & Allen, Ltd., inform us that the contract for all the electrical heating equipment was placed with them. The low-tension circulator is a 100-kW "Bastian" No. 33, and the two high-tension circulators are of the 1,000-kW "Bastian-Reyrolle" type. The company have also just completed a similar installation at Elm Wood Garage, Halifax, and in both cases have collaborated with Messrs. A. Reyrolle & Co., Ltd., in connection with the high-tension boilers.

The Suspension of the E.T.U. London Committee

At a recent delegate conference called for the purpose of enabling the Executive Committee of the Electrical Trade Union to explain its action in suspending the London District Committee a resolution was passed "that the Executive Committee appoint scrutineers to examine the recent ballot for the London District Committee, and put the result into operation."

It was learned later that the Executive Committee has notified the London Branches of its intention to hold a further ballot for the election of a London District Committee.

New "K. & K." Showrooms

The Kensington and Knightsbridge Electric Lighting Co., Ltd., is to open new showrooms at 148, Brompton Road, S.W.3, next Monday.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry informs us that there will be no alteration in wages in the industry on the third pay day in December.

An Australian Radio Company's Activities

It is understood that action may be taken to prevent Amalgamated Wireless (Australasia), Ltd., from continuing to manufacture apparatus. Several Federal Ministers consider that the company's function is to deal with communications, and that it should not compete with private firms in the manufacturing field, as part of its income is derived from listeners' fees. The agreement between the company and the Government presents legal difficulties, but the possibility of an amending Act is being investigated by the Attorney-General's Department.

Local Exhibitions

An electrical exhibition arranged by the Electricity Department of the East Grinstead Urban District Council, was formally inaugurated last week by Mr. R. B. Matthews.

The Lichfield County Council has decided to hold an electrical exhibition at the Guildhall early in December.

New Wallasey Showrooms and Offices

Wallasey Electricity Committee has obtained permission to utilise the Conway Street open space in Wallasey Road for the erection of a showroom and offices for the Electricity Department. The scheme was twice rejected by the Parks Committee, but eventually was approved by the Town Council. Application for sanction to a loan for the building of the premises will now be made to the Electricity Commissioners.

Exterior Hotel Lighting

The Alpha Manufacturing & Electrical Co., Ltd., informs us that it was responsible for the complete electrical installation at the Hinchley Wood Hotel illustrated in our last issue (page 737). The floodlighting units were fitted into lanterns made to the design of the architects, Messrs. F. J. Fisher & Son.

Battery Manufacturers' Progress

Messrs. Watson & Henderson, Ltd., who in September last started the manufacture of dry batteries at Low Fell, near Gateshead, are expecting to increase the number of workmen employed from 40 to 100.

Employment During October

The *Ministry of Labour Gazette* states that employment in the engineering industry during October showed a slight improvement, but was very bad on the whole. The total out of work was 268,527, as against 274,055 in September, while the percentage fell from 28 to 27.5. In the electrical engineering section employment was moderate, the unemployed num-

bering 15,034, as against 15,028, the percentage being approximately 16. There were substantial decreases in both the electrical cable, wire and lamp manufacturing group, from 12,707 to 12,305 (from 10.8 to 10.5 per cent.), and in the electrical wiring and contracting industry from 4,506 to 4,379 (18 to 17.5 per cent.).

The Wholesalers' Dinner

The annual dinner of the Electrical Wholesalers' Federation is to be held at the Savoy Hotel on February 2nd.

Swedish Electrical Imports and Exports

The imports of electrical machinery into Sweden during September last amounted to a value of £90,605, as compared with £156,905 in the corresponding month a year ago. There was also a decline in the exports of electrical machinery from £246,405 to £148,615.

Bristol Contractors' Dinner

The annual dinner of the Bristol Branch of the Electrical Contractors' Association will be held at the Royal Hotel, Bristol, on January 5th.

Recent Contracts

Talking film equipment manufactured by the British Thomson-Houston Co., Ltd., is at present being installed under such widely different conditions as are found in India, Uganda, Spain, Cyprus, and the Canary Islands. In India, particularly, installations are being carried out at a rapid rate, the B.T.-H. talking film business in India being handled by the Bombay Radio Co. The apparatus used is very suitable for tropical service and complies with the most stringent fire regulations.

The Sheffield Town Hall has just been equipped with special amplifying apparatus by the Gramophone Co. in order that speakers in any of the five halls in the building may be heard without difficulty. Arrangements have also been made for the microphones and amplifiers to be used for reproducing radio and gramophone programmes.

In collaboration with their associates in South Africa, Messrs. Guest Sykes of Johannesburg, Messrs. Yarrow & Co., Ltd., have received an order for three water tube boilers for the power station at the new steel works of the South African Iron and Steel Industrial Corporation, Ltd., at Pretoria. The boilers are of the high-efficiency type specially designed for burning blast furnace gas, coke, and coal. The order was obtained in competition with Continental boilermakers.

The English Steel Corporation (Vickers Works, Sheffield) has received orders for high-pressure boiler drums for large electrical power plants of a value between £80,000 and £90,000.

The Brush Electrical Engineering Co., Ltd., has received an order from the Malta Government for a 3,750-kW Brush-Ljungstrom set.

Mr. T. F. Snow has received a Government contract for 33 tons of leaf-headed wall nails.

Trade Announcements

From to-day (Friday) the address of the Publicity Department of the Chloride Electrical Storage Co., Ltd., will be 117/119, Battersea Park Road, S.W.11.

Mr. John Manning has recommenced the electrical engineering business at Holsworthy, Devon, formerly carried on by S. L. Manning & Son.

The Provincial Incandescent Fittings Co., Ltd. ("Pifco" Ltd.), has opened showrooms and offices at 150, Charing Cross Road, W.C.2, in order to provide a better service for its customers in the South of England. The new depôt is under the personal supervision of Mr. J. Webber.

The telephone number of the Blackburn branch of the General Electric Co., Ltd., has been altered to Blackburn 4141/2.

To further improve their service to London buyers, Messrs. Ferranti, Ltd., have had teleprinters installed connected by private line between Hollinwood and their London office at Bush House. A pamphlet has been prepared giving particulars of this innovation.

Particulars are given under "New Companies Registered" (p. 800 of this issue) of the registration of Richardsons Westgarth-Brown Boveri, Ltd., with a nominal capital of £10,000.

New Bishop's Stortford Showrooms

The opening of additional showrooms by the North Metropolitan Electric Power Supply Co. is becoming a more or less everyday occurrence, but the new premises opened at Bishop's Stortford last Wednesday are rather out of the ordinary. The particular interest of the building lies in the fact that before conversion it was the old "White Horse Inn," which is said to have been built in the reign of Edward VI. As far as possible the premises have been left in their original form, and now consist of a small showroom proper, out of which leads a showroom annexe and a large demonstration kitchen. Upstairs there is accommodation for special displays. To a great extent the old timber work has been retained and the whole showroom presents a singularly attractive appearance, as the accompanying illustrations show. Since the Northmet Co. acquired control of the Bishop's Stortford, Harlow & Epping Gas & Electricity Co. in June, 1931, the output of electricity has been more than doubled.

The staircase of the new Bishop's Stortford showrooms

Dutch Bauxite for Japan

According to reports from Holland, good progress is being made in connection with the negotiations for the establishment of a bauxite industry on the island of Bintam, in the Dutch East Indies. It is hoped to find a market in Japan, where a scheme is on foot for the establishment of an aluminium industry with the support of the State. The Japanese import about 10,000 tons of aluminium from the United States per annum, but it is desired to become independent of this source.

Social Events

The G.E.C. Dramatic Society's productions are always of outstanding merit, and last week's performances of Howard Irving Young's "Hawk Island" at the Portland Hall, W.1, were no exception. Dudley Pearmain, whose capability as producer is well known, was admirably suited for the rôle of Gregory Sloane and, after a little nervousness at the start, gave a very polished and natural rendering of the somewhat difficult part. Yvonne Wray was very natural and attractive as the heroine, Sally Rogers, while W. H. Avenell acquitted himself well as Tom Austen, the murderer. It was unfortunate that the rôle of murder-story writer did not give Ronald Levenger more scope. In addition to those already mentioned, the cast included Norah Symonds, Kathleen Trevena, Constance Needham, Ivy Wray, Ronald Palmer, Stanley Wells, Derrick Murdoch, Frank Lewis, and Edward Penwarden.

The "White Horse Inn," Bishop's Stortford, before and after conversion into showrooms for the Northmet Company

The annual staff dinner of Messrs. Crompton Parkinson, Ltd., was held on November 14th at the Tricity Restaurant, Strand, W.C., and was attended by a large gathering. The dinner was followed by a dance and a cabaret.

Belgian Gasfilled Lamp Litigation

The Société de la Manufacture Belge de Lampes Electriques, of Brussels, recently brought an action in the Belgian Courts against a firm which it accused of infringing Belgian patent No. 266,599 of April 11th, 1914, in respect of gasfilled electric incandescent lamps. The Court decided that while the second claim of the patent was partially null, the defendants had infringed the patent so far as its first claim was concerned and gave damages against them to the plaintiff company.

A window at Crown House, Aldwych, depicting the large motor recently supplied to India by the B.T.-H. Co.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, Etc.	Price Nov. 23rd.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3½d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, Etc.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£145	£1 dec.
Grade II ... ... ,,	£102	—
Grade III ... ... ,,	£55	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9¼d.	—
c ,, Wire, basis ... ... ,,	7¼d.	—
c Copper Tubes (solid drawn) ... ... ,,	10d.	—
g ,, Bars (best selected) ... ... per ton	£65	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£36 5s.	—
d ,, ,, Sheets... ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£42	—
d ,, ,, H.C. Wire ... per lb.	6 1/16d.	¼d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) ... ... per ton	58/6	—
i ,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£13 10s.	10s. dec.
g Mercury ... ... per bot.	£10 10s. to £10 15s.	—
e Mica (in original cases) small ... per lb.	6d. to 8/6	—
e ,, ,, medium ... ,,	4/– to 8/–	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1d.	—
p ,, ,, drawn bars & rods ,,	10¾d.	¼d. inc.
p ,, ,, rolled strip & sheet ,,	10¼d.	—
p ,, ,, wire ... ... ,,	11⅛d.	¼d. inc.
o Platinum ... ... per oz.	£9 10s.	—
d Silicium Bronze Wire... ... ... per lb.	7½d.	¼d. dec.
r Steel, magnet, in bars... ... ... ,,	7½d.	—
g Tin, Block (English) ... ... per ton	£154 10s. to £156 10s.	£1 10s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/1	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India-Rubber, Gutta-Percha and Telegraph Works Co. Ltd.
f James & Shakespeare.
g Edward Till & Co.
h Bolling & Lowe.
i Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

Japanese Lamp Exports to the U.S.A.

The rapid development of the Japanese glow lamp industry is shown by the increasing exports to the United States. Since 1928 the Japanese exports to this destination have increased by 140 per cent., notwithstanding the import duties, which were fixed in 1930 at 20 per cent. of the value for wire filament lamps and at 30 per cent. for lamps with carbon or other non-metallic filaments. In numbers the deliveries to the United States were 37 million lamps in 1928, 44 millions in 1929, 40.5 millions in 1930, and 70 millions in 1931, while the number in the current year is estimated to reach 88.8 million. The larger part of the increase applies to miniature or fairy lamps specially for Christmas trees, and most of these are fitted with carbon filaments. Japanese lamps have gained a large hold on the American market owing to cheap labour and the depreciation of the Japanese currency; the lamps are said to be offered at one-sixth of the price charged by American companies.

American Radio Dispute Settled

A settlement has been effected in the Federal District Court of the suit brought by the Government against the Radio Corporation of America and its associated companies. The defendants, comprising fourteen companies, were alleged to have violated the Anti-Trust Laws by restraining domestic and foreign commerce and communications, owing to their virtual monopoly of the wireless trade in America, but this was denied. The case against four of the companies, General Motors Corporation, General Motors and Radio Corporation, the American Telephone & Telegraph Co., and the Western Electric Inc., were dismissed at the request of the Government, but an injunction decree was issued against the remaining defendants. The American General Electric Co. and the Westinghouse Electric, with controlling stock and interest in the Radio Corporation of America, are to divest themselves of their stockholdings, as well as their respective subsidiaries, in the Radio Corporation of America.—*Reuter* (Wilmington, Delaware).

German Electrical Imports and Exports

The official returns just to hand show that the imports of electrical machinery and apparatus into Germany during the eight months ended with August last attained a value of £769,850, as compared with £1,204,300 in the corresponding period of 1931. The exports of similar material from Germany during the same period amounted to £11,039,200, as compared with £15,623,050 in the similar period a year ago. The import total was made up of £116,750 of electrical machinery, and parts and apparatus to the extent of £653,100. The respective figures for the exports were £2,752,900 and £8,286,300.

More E.A.W. "Diplomées"

The Electrical Association for Women informs us that at a meeting of the Training and Diploma Committee on November 4th the Grade I (Demonstrator's) Diploma was awarded to seventeen ladies, raising the total now in possession of the diploma to 132. After January 31st, candidates will be required to pass an examination, details of which are to be announced later.

Overload Protection for Motors

In a little brochure entitled "Overload Protection for Electric Motors," Messrs. Geo. Ellison, Ltd., give some useful information. Electric motors will not stand 25 per cent. overload for more than 15 minutes if less than 4 h.p., 30 minutes if from 4 to 10 h.p., and 2 hours if over 10 h.p. The various methods of protection are discussed and the case is stated for the use of solenoid or magnetic-type overload releases capable of acting at less than 25 per cent. overload.

Change of Name

Royce, Ltd., Trafford Park, Manchester, has changed its name to Factory Holding, Ltd.

New Catalogues and Lists

Visco Engineering Co., Ltd., Stafford Road, Croydon.—An illustrated leaflet (No. 322), describing the "Visco" self-cleaning, rotating air filter.

Engineering & Lighting Equipment Co., Ltd., Sphere Works, St. Albans.—A leaflet showing various types of "E.L.E.C." shop-lighting fittings.

Geo. Bray & Co., Ltd., Leeds.—A catalogue (No. C.17), dealing with "Chromalox" boiling plates.

George Ellison, Ltd., Perry Barr, Birmingham.—A booklet explaining the various methods of overload protection for electric motors.

Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.—Catalogue sheets Nos. C 25-32, containing particulars of the company's latest type polyphase and unbalanced load recording wattmeters with 3½-in. chart and straight time lines.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—An illustrated folder (No. O.S. 6371), descriptive of "Osram" decoration lamp outfits.

Electrical Equipment & Carbon Co., Ltd., 107/111, New Oxford Street, W.C.1.—List H.S.1, giving details and prices of the "H.S." motor-car direction indicators. Also list H.D.1 on the company's new "Maxim" line clamps.

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester.—Publications Nos. 10A3 and 56A1, giving, respectively, the salient features of the round tank breaker, and a survey of the company's rural switchgear manufactures.

Henley, Burrowes & Co., Hudsons Drive, Cotteridge, Birmingham.—An illustrated price list of "childproof" switchplugs.

M.K. Electric, Ltd., Wakefield Street, Edmonton, N.18.—A 96-page catalogue of electrical accessories, containing particulars of a number of new lines. A thumb index is provided.

British Insulated Cables, Ltd., Prescot, Lancs.—Leaflet No. P.F.100, dealing with ironclad service cut-outs.

Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1. —Service manuals relating to "Model 139" speaker and "Model 252" three-valve battery operated receiver.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—Price list section "B.D." relating to flexible cords. Also a catalogue of "Pyrobest" cables, wires and flexible cords.

Wholesale Fittings Co., Ltd., 23, Commercial Street, E.1.—Catalogues Nos. E261, 275 and 280, relating, respectively, to commercial and industrial lighting, "Supastone" three-play glass, and decorative lighting.

India Rubber, Gutta Percha & Telegraph Works Co., Ltd., Aldwych House, W.C.2.—A booklet giving full particulars of the "Silvertown" wiring system. A number of reductions in the prices of wires and cables is announced.

Girlings, Ltd., Maldon, Essex.—List No. 153, describing the company's wide range of mosaic electric fires. Also a leaflet dealing with a grilling attachment for fires.

Bankruptcy Proceedings

W. H. J. Willcox, radio dealer, 66, Soundwell Road, Staple Hill, near Bristol.—The first meeting of creditors was held at the Official Receiver's Office, 26, Baldwin Street, Bristol, on November 18th. A statement of affairs was submitted which showed liabilities of £366, and a deficiency of £265. The failure was attributed to "insufficient capital and lack of business ability in dealing with the credit side of the business." It appeared that the debtor's business consisted chiefly in the supply of wireless sets on a hire and maintenance service covering a period of 78 weeks. The case was left in the hands of the Official Receiver.

J. H. Maddox (lately trading as the Imperial Electrical Supplies Co.), lately of 14, Whitecross Place, Finsbury Pavement, E.C.—The public examination was held on November 18th before Mr. Registrar Mellor at the London Bankruptcy Court, the accounts showing liabilities of £520 and assets nil. Debtor attributed his failure to trade depression and lack of capital. The examination was concluded. The following are the principal creditors: Edison Swan Electric Co., Ltd., £59; Electric Lamp Factors, Ltd., £136; General Electric Co., Ltd., £139; and Philips Lamps, Ltd., £51.

H. G. Hutchinson (Eagle Distributing Co.), wireless distributor, "Cranleigh," Langho, near Blackburn.—First meeting to-day (Friday) at the Official Receiver's office, District Bank Chambers, Blackburn. Public examination December 7th at the County Court House, Victoria Street, Blackburn.

J. Vigon (Modern Electrical Installations), electrical and radio engineer, 355, Commercial Road, E.—Last day for receiving proofs for dividend, November 29th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

R. O. Woodruff, electrical and radio engineer and contractor, 4, Bridge Parade, Godstone Road, Purley.—Last day for receiving proofs for dividend November 29th. Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C., Official Receiver.

A. Lester, wireless dealer, 37, Aldersgate Street, E.C.—Receiving order made November 16th on a creditor's petition.

C. Marquis, wireless dealer, 9, Farringdon Avenue, E.C.—Receiving order made November 16th on a creditor's petition.

H. C. Mealing (Yorkshire and Lincolnshire Electric Development Co.), electrical trader, 73, Lawrence Street, York.—Receiving order made November 14th on debtor's own petition.

W. A. Beaumont, electrical engineer, 44, Warrengate, Wakefield.—Last day for receiving proofs for dividend December 3rd. Trustee, Mr. B. S. Briggs, 13, Burton Street, Wakefield. Official Receiver.

D. T. Donovan and **H. A. Langlois** (London Electrical Co.), 119, St. Mary Street, Cardiff.—First and final dividend of 2d. in the £, payable November 28th at the Official Receiver's office, 34, Park Place, Cardiff.

N. G. Crews, electrical engineer, 99, Clapham Road, Lowestoft.—First and final dividend of 9d. in the £, payable November 22nd at the Official Receiver's office, 4, Eastbourne Place, Prince of Wales Road, Norwich.

J. G. H. Coomber (Popular Radio Stores), wireless dealer, 43, Wakefield Road, Bradford.—Receiving order made November 11th on debtor's own petition. First meeting November 25th at the Official Receiver's office, 71, Manningham Lane, Bradford. Public examination December 16th at the County Court, Manor Row, Bradford.

C. A. Whittington, electrician and wireless dealer, 400, Abbeydale Road, Sheffield.—Receiving order made November 11th on debtor's own petition.

Company Liquidations

North Staffordshire Tramways Co., Ltd.—Meeting December 22nd at 88, Kingsway, W.C., to receive an account of the winding-up by the liquidators, Messrs. R. P. Beddow and H. W. Davis.

This Bush Radio talkie demonstration van has its electrical power requirements supplied by the 7-kW generator attached in front of the radiator. The vehicle was made by Messrs. Dodge Bros. (Britain), Ltd., and the back opens to provide a rubber screen, while the interior houses the loudspeakers, sound apparatus and projector

Wallingford and District Electric Supply Co., Ltd.—Particulars of claims by December 17th to the liquidator, Mr. H. Fraser, 4, Fenchurch Avenue, E.C.

Barrons Radio Supplies, Ltd.—Winding up voluntarily. Particulars of claims by December 18th to the liquidator, Mr. J. W. Westhead, 12, Birley Street, Blackpool.

Indo-European Telegraph Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. R. Smith, 5, London Wall Buildings, E.C.

Private Arrangement

F. Moorton, radio engineer, 78, Ocklynge Road, Eastbourne. —At the adjourned meeting of creditors held recently at the offices of Messrs. Stapley & Hurst, Eastbourne, it was decided that efforts should be made to dispose of the stock privately and that the book debts should be collected and the proceeds distributed to the creditors. It was also decided that the debtor should enter into an arrangement to pay Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, a sum of £2 per month until the creditors had received 10s. in the £.

Dissolution of Partnership

Lee & Swindells, wholesale manufacturers and dealers in electric lamps and wireless valves, Smithy Lane, King Street West, Manchester.—Messrs. G. Lee and J. Swindells have dissolved partnership. Mr. Lee will attend to debts and carry on the business, and Mr. Swindells will carry on a similar business at 2, Foundry Hill, Salford, Blackburn, on his own account.

Germany's Electrical Export Trade

DURING the past year the whole of German economy has been dominated by the policy of protecting the mark exchange. Largely as a result of this, states a Department of Overseas Trade report on conditions in Germany up to August last, the electrical engineering trade, which was relatively well situated in previous years owing to the progressive use of electricity in other branches of industry, suffered a serious set-back.

The market became very depressed and orders received from power stations, the railways and the Post Office were generally low and mostly for maintenance work and not for new installations. The demand for radio apparatus proved an exception and was slightly higher for the season 1931-32 than in the preceding year.

In comparison with the foreign trade of other countries, German exports (see also ELEC. REV., August 12th, p. 225) developed very favourably in 1931 and, in spite of falling prices, some firms actually increased the total value of their exports. Exports of electrical machinery, apparatus and equipment decreased from Rm. 629.47 million in 1930 to Rm. 558.23 million in 1931, but, as a percentage of total exports from Germany during the year, rose from 5.2 per cent. to 5.6 per cent.

Compared with the exports of electrical goods by other countries, Germany increased her proportion of world exports from 40.9 to 46.6 per cent.; the United States figures remained at about one-third of the 1930 total, and British exports declined from 24.4 per cent. in 1929 to 19.7 per cent. in 1931. An analysis of the exports shows that there was a falling off in all branches except heating and cooking apparatus, which increased from Rm. 12.93 million to Rm. 13.14 million, and radio apparatus, which rose from Rm. 78.20 million to Rm. 78.22 million. Exports to European countries declined from Rm. 501.88 million to Rm. 447.72 million, but the proportion of European sales outside Germany to total exports rose from 79.7 per cent. to 83.2 per cent. for the same years. German sales to other countries suffered more heavily; between 1929 and 1931, exports to South America decreased from Rm. 59.08 million to Rm. 37.78 million, to North and Central America from Rm. 19.47 million to Rm. 7.85 million, and to markets in Asia from Rm. 49.88 million to Rm. 31.71 million.

During the early months of 1932, the turnover both in high and low-pressure electrical products decreased considerably in comparison with the figures for the corresponding period of 1931. Foreign orders were stated to be about 20 per cent. below those of last year and to have been secured only at extremely low prices.

The home market would appear to offer further scope for the German radio industry, as the number of registered listeners per 1,000 inhabitants in 1931 was only 64, compared with 94 in the United Kingdom, 129 in the United States, and 145 in Denmark. In the first six months of 1932, German radio exports were valued at Rm. 17.3 million, compared with Rm. 35.3 million in the corresponding period of 1931. Sales to the United Kingdom fell off by Rm. 5 million to Rm. 620,000. Total imports of radio apparatus decreased from Rm. 5.6 million to Rm. 3.2 million. Several important firms suffered heavy losses on the year's working; sales fell off between 25 per cent. and 33 per cent., and in most cases dividends were either reduced or passed entirely.

Electricity Supply

Lighting, Domestic, Power

Aldershot.—TARIFF REVISIONS.—The Town Council has reduced the flat rate for lighting from 6d. to 5½d. per kWh, and has adopted an alternative two-part tariff for domestic supplies and business premises, the "unit" charge in each case being 1d.

Annan.—OVERHEAD LINES OBJECTION.—Strong opposition to the proposal of the Dumfries County Council to erect overhead lines in the burgh was made at the last meeting of the Town Council, and an objection is to be lodged with the Board of Trade.

Annfield Plain (Co. Durham).—STREET LIGHTING IMPROVEMENTS.—The Urban District Council is to consider the question of improving the electric lamps in Front Street and providing additional lamps in Greencroft Terrace.

Armenia.—HYDRO-ELECTRIC STATION OPENED.—A 31,500-h.p. hydro-electric power station has started operating in Armenia, according to the Tass Agency. It is understood that part of the power generated will be utilised for the electrification of the section of the Transcaucasian Railway between Tiflis and Leninakin.—*Reuter* (Moscow).

Barking.—SEWAGE STANDBY PLANT.—The Barking and Ilford Joint Sewerage Committee is to interview the Ministry of Health with regard to standby generating plant proposed to be installed.

Barnard Castle.—EXTENSION ASKED FOR.—The Rural District Council is to negotiate further with the North Eastern Electric Supply Co., with a view to the extension of electrical facilities to Lane Side, Middleton, and Station Cottages, Cockfield. Up to the present the Supply Co. has contended that the return would not justify the expenditure.

Bath.—STREET LIGHTING.—The City Council is to reconsider the proposal that the whole of the street lighting of the city shall be converted to electricity.

Bexley.—OUTSIDE LIGHTING.—The Urban District Council has decided to supply electricity for lamps outside business premises of 500 W and upwards for 1s. 3d. per 50 W, plus ¾d. per kWh on the contract rate.

Bognor Regis.—SUPPLY TO SLINDON.—The Bognor Regis Gas & Electricity Co. has recently made electricity available for Slindon. At the informal switching on of the supply the chairman of the Rural District Council commented on the way in which the company had contrived to preserve the amenities of the picturesque village and said that the sub-station kiosk at Well Nap Corner, which had been panelled in white and green, had actually improved the appearance of the place.

Brandon (Co. Durham).—SUPPLY ARRANGEMENTS.—Messrs. Straker & Love, colliery owners, have asked the Urban District Council to relieve them of their contract for the supply of electricity to the East Ward if suitable arrangements can be made with the North-Eastern Electric Supply Co. for supplying the area. The Council has agreed to enter into negotiations with the supply company.

STREET LIGHTING.—The question of lighting the main street of Langley Moor by electricity is to be considered by the Council.

Budleigh Salterton.—REORGANISATION OF SUPPLY SYSTEM.—Provided that the Urban District Council gives its approval, the Budleigh Salterton Electric Light & Power Co., Ltd., is to start work on December 1st on the complete reorganisation of the electricity system and an a.c. supply at the national standard pressure and frequency will be available by next summer.

Canterbury.—EXTENSION ORDER.—The Kent County Council Parliamentary Committee has had before it the Canterbury Electricity (Extension) Draft Special Order, 1932, by which the City Council seeks to extend its area of supply to include parts of the rural districts of Blean, Bridge and Faversham. Objections to the Order have been lodged with the Electricity Commissioners on behalf of the County Council.

Chester.—EXTENSIONS.—The Corporation has extended its electricity supply to Eaton-by-Tarporley. The supply comes from Tarporley and the necessary work has been carried out within one month by Callender's Cable & Construction Co., Ltd. At the switching-on ceremony performed recently by Lady Cecely Hamilton, Mr. S. E. Britton said that the Corporation had spent £100,000 in distributing electricity outside its boundary, and had erected some 170 miles of overhead lines, and 50 transformer sub-stations. The enterprise of the Corporation had been responded to very favourably, and at the present time there were 4,000 consumers connected to the rural area supply, including 300 farmers.

Cockermouth.—ELECTRIFICATION OF DERWENT VALLEY.—The Rural District Council has decided to communicate with the Minister of Transport with a request to hasten the electrification of the villages in the Derwent Valley. It is understood that the County Council has raised objections to the erection of overhead lines without the concurrence of the Rural Council, and that it is due to this that there has been a delay in giving a supply to the district by the Mid-Cumberland Electricity Co., Ltd.

Colchester.—INCREASING USE OF ELECTRICITY.—On taking office as Mayor of Colchester, Councillor Maurice Pye, J.P., referred to the rapid development of the Electricity Department, and especially the increasing use of electricity for domestic purposes. The output of electricity last year was nearly three times that of the year 1929, he said, whilst the number of consumers had increased from 3,508 in 1925 to 15,308 in 1932. The new stores and offices costing £20,000 would make for efficient working. Practically every township and village in North-east Essex now either took a bulk supply from Colchester, or was supplied from its distribution system. Altogether 211 miles of h.p. and l.p. mains had been installed.

LOANS SANCTIONED.—The City Council has received sanction to loans of £50,000 for mains and services, and £11,395 for switchgear, etc.

Darlington.—LOW OPERATING COST.—The Corporation electricity undertaking last year worked at a cost of 0.38d. per kWh, which is claimed to be lower than that of any other undertaking in the country giving a general supply.

Dartford.—TIME SWITCH CHARGES.—The Electricity Committee recommends the reduction of the charge for the hire of time switches to consumers on the restricted hour tariff from 8s. 9d. to 5s. per quarter.

Dover.—CABLE LAYING.—The Electricity Committee is to lay a new cable from the electricity works to the Duke of York's School, Guston, at a cost of £2,250. It is proposed, if possible, to start work early in December.

Egypt.—THE ASSOUAN SCHEME.—The specifications and plans for the hydro-electric works to be erected at Assouan, at an estimated cost of £3,000,000, have been issued by the Ministry of Public Works, but have been temporarily held up pending the approval of Parliament. The adjudication on the plans submitted was originally fixed for May 10th next.—*Reuter* (Cairo).

Fife.—RURAL ELECTRIFICATION.—The Fife Electric Power Co.'s rural electrification scheme is now almost completed and overhead lines have already been erected from Leven, through Elie, St. Monance, Pittenweem, Anstruther to Kingsbarns. The extension of the scheme from Kingsbarns to St. Andrews is under consideration.

Fleetwood.—SUPPLY FOR STALMINE.—Following negotiations between Fleetwood Council and Imperial Chemical Industries, Ltd. (suppliers of electricity for the works at Preesall), there is a likelihood of Stalmine obtaining a supply. The question of supplying the Over Wyre district is also under consideration.

France.—THE BROADCASTING SERVICE.—A *Reuter's Trade Service* message from Paris says that at a recent meeting attended by 122 presidents or representatives of Chambers of Commerce the following resolutions were passed: (*a*) That the Government should reject any Bill on broadcasting implying the institution of a State monopoly; and (*b*) that no wireless tax should be proposed unless an organic statute for French broadcasting has first been established permitting free competition among private enterprises under State control.

Grange-over-Sands.—TARIFF ALTERATIONS.—The Urban District Council has altered its flat rate charges from 9d. per kWh for the first 250 kWh per quarter and 7d. beyond, to 9d. for the first 120 kWh and 6d. beyond. There is also to be a discount of 2½ per cent. for prompt payment of accounts. On the rateable value tariff there is to be a new rate of 1½d. per kWh for the first 200 kWh per quarter, and 1¼d. beyond.

BULK SUPPLY CHARGES.—The Electricity Commissioners are to be approached with a view to obtaining alterations in the terms for the bulk supply from the Barrow-in-Furness Corporation.

Grimsby.—CHEAPER ELECTRICITY.—The following reduction in electricity charges, representing a concession of nearly £12,000 to consumers, is proposed by the Electricity Committee:—Lighting flat rate: From 6½d. to 5½d. per kWh. Lighting, maximum demand system: "Unit" charge from ¾d. to ½d. Lighting, prepayment meter supplies: From 8d. to 7d. per kWh. Heating and cooking: From 1½d. to 1d. per kWh. Power supplies are also made cheaper, and a similar scale of charges is proposed for the area outside the borough.

Hull.—DOMESTIC APPARATUS.—The Electricity Committee has obtained permission to apply £25,000 from the net surplus for the past year for the purchase of domestic apparatus.

Hungary.—POWER STATION EXTENSIONS.—A new 44,000-kVA turbo-generator has recently been added to the power station at Kelenfold, bringing the capacity of the plant, which supplies power to Budapest, up to 230,000 kVA.

Kettering.—EXTENSIONS.—The Electricity Committee has obtained sanction to the borrowing of £2,922 in connection with the supply of electricity to Corby, Great Weldon, Little Weldon and Little Oakley.

THE CHANGE-OVER.—In connection with the change-over in the Mill Road district from d.c. to a.c. an alternative l.p. temporary supply is to be given to the Stamford Road Housing Estate at an estimated cost of £2,512 (exclusive of changing-over services).

Kirkcudbright.—RESULT OF CANVASS.—Kirkcudbright has been canvassed by the Electricity Department of the Stewartry County Council and the response has been fairly gratifying. A large number of the shopkeepers have decided to take supplies and there are also several inquiries for power installations. It is hoped that the supply will be ready by Christmas.

London.—STOKE NEWINGTON.—In November, 1931, the Borough Council approved an extension scheme to augment the supply in the Finsbury Park and High Street districts by the introduction of the a.c. system. This scheme provided for some two miles of underground cables and the Electricity

Committee is making efforts to commence the work at the earliest possible date in order to provide winter work for the unemployed. A special sub-committee has been appointed to deal with tenders for material immediately the final consents are received.

ISLINGTON.—The Electricity Committee has considered a request that any useful scheme which will provide work for the unemployed should be submitted at the earliest possible date, and finds that a h.p. main from Hornsey Rise sub-station to the corner of Stroud Green Road by Seven Sisters Road will be required to deal with the anticipated load for the winter of 1933. The estimated cost of the work is £4,915.

BATTERSEA.—The Electricity Committee proposes to carry out the following works:—Erection of a transformer sub-station in Grayshott Road (£3,795); h.p. feeder from Lavender Hill sub-station to Dickens Street (£5,545); an additional transformer kiosk at Dickens Street (£242); h.p. switchgear at Lavender Hill sub-station (£300); h.p. feeders from Grayshott Road sub-station to Lavender Hill, and a distributor in Eversleigh Road and Broughton Road (£4,110); changing over from d.c. to a.c. on the Beaufoy and Shaftesbury Estates (£5,070); and services at 247 premises (£2,118).

Millport.—SUPPLY PROPOSAL.—The Town Council has approved a proposal by Messrs. Johnson & Phillips, Ltd., to investigate and report on a scheme for providing an electricity supply for the burgh on the same lines as that at Dunoon.

Nairn.—TOWN WANTS SUPPLY.—At a recent meeting the Town Council decided to take immediate steps to install electricity in the town, as a temporary measure, until the scheme of the Grampian Electricity Supply Co. is ready.

Paignton.—ELECTRICITY FOR TWEENWAY CROSS AREA.—The Paignton Electric Light & Power Co., Ltd., hopes to be able to give a supply of electricity in the vicinity of Tweenway Cross by Christmas.

Penzance. — ELECTRICITY CHARGES. — At a recent meeting of the Town Council the Lighting Committee reported there was good ground for a reduction in the maximum flat rate charged by the Cornwall Electric Power Co., and recommended that an application should be made to the Ministry of Transport should negotiations with the company fail to produce any result. The matter was left in the hands of the town clerk.

Portland. — EXTENSIONS. — The Electricity Committee is applying for sanction to the borrowing of £3,804 for extensions.

Portsmouth.—MAINS EXTENSIONS.—The Electricity Committee has decided to extend mains to Denmead and Hambledon at an estimated cost of £2,202.

Preston.—SUPPLY TO COAST TOWNS.—The Electricity Committee has appointed a sub-committee to consider questions relating to the supply of electricity to the coast towns.

Rishton (Lancs).—STREET LIGHTING.—The Urban District Council spent a considerable time last Friday discussing street lighting. Councillor Sanderson claimed that to relight a road with gas as proposed was a backward step. Electricity was much more efficient. Councillor Booth, opposing, said that as members of Accrington Gas Board they should insist on gas. Voting resulted in a tie, and the chairman gave his casting vote in favour of electricity. The question was referred back for amendment.

Ross-shire.—OVERHEAD LINE EXTENSIONS.—The work of erecting overhead lines connecting Fortrose and Rosemarkie and villages *en route* with the main system of the Ross-shire Electric Supply Co., Ltd., at Muir of Ord is progressing, and it is anticipated that the scheme will be extended to Cromarty.

Salford.—NEW COMMITTEE FORMED.—A new committee of the City Council to be known as the Light, Heat and Power Committee, has now been set up and will in future control the Corporation's gas, electricity and lighting undertakings. It replaces the Gas, Electricity and Lighting and Cleansing Committees.

Scilly Isles.—STREET LIGHTING.—The oil lamps at present in use in the main streets are to be replaced by electric lighting.

Southend-on-Sea.—ILLUMINATIONS POPULAR.—The recent illuminations carried out at Southend have proved so popular that residents are now signing a petition asking the Town Council to provide illuminations along the Promenade similar to those at Blackpool.

Stonehaven.—SUPPLY PROSPECTS.—Electricity will be available in Stonehaven before the next lighting season, and the Grampian Electricity Supply Co. is losing no time in making arrangements for the transmission line route through Stonehaven *via* Laurencekirk. It is hoped that the company will be able to institute wayleave negotiations with proprietors in the course of the next few weeks.

Sutton Coldfield.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £319 to supply houses being erected on the Chester road by Messrs. Stanton & Judd, of Streetly.

Sweden.—WATER POWER DEVELOPMENT.—The development of Sweden's water power resources is being energetically pushed forward, and two of the largest power stations in the country, with a combined maximum capacity of about 210,000 h.p., are at present under construction. The Kraangede Power Co. in North Sweden, which will deliver energy for industrial purposes in Central Sweden as well as for the State Railways and the city of Stockholm, will, when the Kraangede falls are fully exploited, have a capacity of about 180,000 h.p. The other undertaking is the Government Waterfalls Department's Vargoen station, which will have a capacity of 30,000 h.p. The work on this plant was begun in 1928 and employs 250 men.

Torrington.—LIGHTING OF THE INSTITUTION.—The Devon Public Assistance Committee has approved of the installation of electric lighting at the Torrington Institution, and tenders are to be invited as soon as the estimate has received the sanction of the County Council.

Wakefield.—PROGRESS DESPITE DEPRESSION.—In spite of the serious economic and trade depression the number of new consumers connected during the year ended March 31st last was 2,251—nearly double last year's record figure. Sales of electricity for power purposes increased by 1½ per cent., and for domestic lighting and heating by 11 per cent.

Exceptionally even distribution and high visibility have been obtained in the new lighting installation at Bridge Street, Peterborough, by the use of prismatic dome refractors. The fittings and standards have been specially designed by the Revo Electric Co., Ltd., to harmonise with the surrounding architectural features

Watford.—REDUCED CHARGES.—The Town Council has reduced the charges at Hemel Hempstead, Bovingdon, and Kings Langley from 12½ per cent. in excess of the rates in the borough to 5 per cent. The minimum fixed charge under the two-part tariff is now £4 17s. per annum, and the charge through prepayment meters is reduced to 6½d. per kWh.

West Hartlepool.—SATISFACTORY RESULTS.—Mr. S. Tillotson, the borough electrical engineer, tells us that the actual amount involved in the recent reductions in electricity charges and the rebate to consumers is £3,300 per annum. Following a profit of £9,650 for the year ended March 31st last, the undertaking's affairs at West Hartlepool appear to be in a very satisfactory state.

Willington (Co. Durham).—COUNCIL MAY TAKE OVER DISTRIBUTION.—Further consideration has been given by the Urban District Council to the possibility of the Council's distributing electricity in its own area. In 1926 the Council endeavoured to make arrangements with Messrs. Straker and Love for a bulk supply, but the scheme was rejected by the Electricity Commissioners. The Council has now asked the Works Committee to consider the proposal again.

Traction

Argentina.—BUENOS AIRES UNDERGROUND PROPOSAL.—The Socialists on the Buenos Aires Municipal Council have submitted a proposal for the construction and operation by the municipality of an underground railway.—At present Buenos Aires has two underground railways, one of which is run by the Anglo-Argentine Tramways Co., a pre-dominantly British-owned concern. A scheme for the unification of Buenos Aires transport has been put forward but has not yet materialised.—*Reuter* (Buenos Aires).

ROSARIO TRANSPORT SERVICES.—The *Monthly Review* of the Bank of London & South America, Ltd., states that the Rosario municipality has taken over the tramway services of the city, which are now being administered by an "Empresa Mixta de Transportes" with a uniform tariff of 10 cents on all lines.

Australia.—NEW SOUTH WALES TRANSPORT BILL.—The Transport Bill which has been introduced in the New South Wales Parliament substitutes for the existing nine Commissioners a board of three—one each for railways, road transport and tram-

way, and main roads. Each will work independently under the Minister for Transport, and will be appointed by the Governor. It is stated that Mr. W. J. Cleary, former Chief Commissioner of Railways, will be Commissioner for Railways; Mr. S. A. Maddocks, former chairman of the Transport Commission, Commissioner for Road Transport; and Mr. H. H. Newall, Commissioner for Main Roads.

SYDNEY.—TROLLEY-BUS EXPERIMENT.—Following an investigation by the authorities of different methods of street transport, Mr. S. A. Maddocks, Acting Commissioner of Transport, is considering the installation of one or two trolley-buses for experimental purposes on the Sydney tramway system.

Brazil.—RAILWAY ELECTRIFICATION DELAYED.—According to the *Monthly Review* of the Bank of London & South America, Ltd., the recent military operations in the zone of the Central of Brazil Railway have impeded the requisite studies being made by interested firms in connection with the proposed electrification of this railway. In response to a special petition made by the Italian Ambassador, and supported by representatives of other countries, the Minister of Transport has granted an extension to December 15th for the submission of tenders for the work involved.

Dover.—THE TROLLEY-BUS BILL.—The Town Council has decided not to proceed with the promotion on the Parliamentary Bill authorising the Corporation to substitute trolley-buses for the trams.

France.—UNEMPLOYMENT RELIEF SCHEME.—A scheme to relieve unemployment recommended by the Conseil National Economique is the immediate electrification of 1,625 km of railway.—*Reuter's Trade Service.* (Paris).

London.—THE STANMORE EXTENSION.—The new 4½-mile extension of the Metropolitan Railway from Wembley Park to Stanmore will be inaugurated by Mr. P. J. Pybus, Minister of Transport, on December 9th. The line will be opened for public service on the following day.

Portuguese East Africa.—TROLLEY-BUSES FOR LOURENCO MARQUES.—According to the *Electric Railway, Bus and Tram Journal*, the Portuguese Port Authority of Lourenço Marques has decided to adopt trolley-buses and is to spend £25,000 on the first instalment of the scheme.

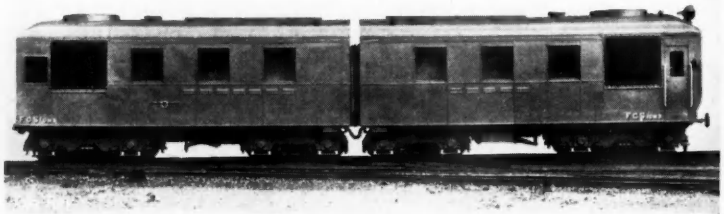
Russia.—MAIN-LINE ELECTRIFICATION.—*Modern Transport* states that the first main-line electrification scheme of the U.S.S.R. has recently been completed. It comprises the 40-mile section from Zestafoni to Khashuri on the Batoum-Baku line, where continuous gradients of 1½ to 3 per cent. predominate. The electrification is carried out on the 3,000-V d.c. system, and the eight 2,725-h.p. locomotives placed in service are equipped with regenerative braking. Two of these locomotives were built in the United States, most of the equipment for the remainder being constructed in Russia. A further seven locomotives, which are now being put into service, have been built in Italy.

South Shields.—CURTAILMENT OF EXPENDITURE.—The Town Council is to curtail expenditure on its tramway service.

Communications

Brazil.—TELEPHONE SERVICE EXTENDED.—The Anglo-Brazilian telephone service has been extended to the State of Minas Geraes, the charge for a call from London being £6 for the first three minutes and £2 for each subsequent minute.

France.—MORE POWER FOR TOULOUSE.—Experimental transmissions on a power of 60 kW are now being made by Radio Toulouse and the high power will be used regularly as soon as official permission is obtained.



One of the Armstrong Whitworth "mobile power stations" for Argentina described on page 777

Germany.—TWO NEW STATIONS.—The *Wireless World* says that two new 60-kW broadcasting stations will be put into service in Germany shortly. Munich on 533 metres is expected to begin regular transmission almost immediately, while the opening of the new Berlin transmitter will probably take place in January.

Great Britain.—RADIO RELAY EXCHANGES.—Portland Urban District Council has decided, subject to permission being obtained from the County Council, to grant permission to the National Broadcast Relay Company to operate a relay service.

The Wealdstone Highways Committee cannot agree to a proposal for a ten years' agreement with Wembley Relay Service, Ltd., for a relay service, but is willing to permit an experimental service on one of the Council's housing estates for one year. Letters have been received from various radio organisations asking the Council to receive a deputation before it takes any irrevocable step in the matter.

The Ossett Radio Relay Services, Ltd., had made application to the County Council for permission to place wires across county roads in Ossett. A draft agreement in connection with the matter has been submitted and approved by the Corporation.

At a recent meeting of the Kettering Urban District Council the Town Planning Committee reported that it had under consideration an application for permission to install relay services in the town, and that it had adjourned further consideration pending additional information being supplied.

The Broadstairs and St. Peter's Urban District Council has decided to invite tenders for the privilege of operating a relay service for the town. There have been partial services by Mr. F. H. Austin, of St. Peter's, and the Broadcast Relay Service, Ltd.

The Isle of Ely Highways Committee has approved proposals for the establishment in the town of March of a relay service by the Super Relay Service, Ltd., subject to the payment of 2s. 6d. per annum for each street crossing. Similar proposals by the National Broadcast Relay Co. have been rejected, as it is considered that there is insufficient scope for the satisfactory operation of rival services.

Glasgow.—RADIO FOR POLICE USE.—Chief Constable P. J. Sillitoe, who is taking great interest in the proposed establishment of a police wireless transmitting station in the city, attended a demonstration by the Marconi Co. at the Police Headquarters last Friday.

Holland.—BROADCASTING STATISTICS.—According to *World-Radio*, the number of receiving sets owned by individual listeners in Holland at the end of September last was 294,814, while 259,364 persons were registered as members of groups sharing sets—the reception on which is distributed by household telephone wires. The total number of listeners was 68 per 1,000 of the inhabitants.

India.—PROGRESS IN COMMUNICATIONS.—The radio-telegraph link between India and Japan and the radio-telephone link between India and Great Britain are about to be completed and now other schemes for the development of wireless connections between India and the rest of the world are engaging the attention of the Indian Radio and Cable Communications Co. The difficulties and high cost of buildings and maintaining a sufficient number of overhead lines through the jungle between its control office in Bombay and Kirkee and Dhond have led the company to replace such lines by a wired-wireless installation operating on one of the two existing telephone pairs with the other pair as a spare. The installation, which has been ordered from the Ericsson Telephone Co., is the first multi-channel system to be erected in India with both telephone and telegraph carrier channels on the same pair.

THE CEYLON RADIO-TELEPHONE SERVICE.—Sir William Barton, representative of Imperial and International Communications, Ltd., has arrived in Ceylon in connection with an offer made some time ago regarding the island's telephone service, which is operated by the Government. The offer at the time was refused on the ground that the price was inadequate, but Sir William is inviting the Government Department concerned to discuss the matter further. It is proposed to float a company in Ceylon with a capital of £100,000 with a view to providing a radio-telephone link between Ceylon and Bombay, thus making it possible to communicate with London *via* Bombay.

Italy.—LICENCES.—According to the *Daily Telegraph*, there are in Italy 239,000 wireless licences for a total population of 42,000,000. Milan leads with 31,157, while Rome has 19,362.

London.—TELEPRINTERS FOR POLICE.—The City Corporation Police Committee is to install a teleprinter service for the City of London Police in conjunction with the Metropolitan Police Force, and also "Telex" facilities for telephone communications between the city and provincial police forces.

New Zealand.—LICENCES.—The fillip given to radio in New Zealand by the progressive policy of the recently created Broadcasting Board, and by general interest in the Empire Broadcasting scheme is reflected in the licence returns for August, when the unusually high total of 3,552 new licences was recorded. *World-Radio* says that the increase is 463 in excess of the advance for the preceding month, and the grand total of licences in the Dominion is now 81,656, nearly 7,000 more than last year's figure. The proportion of receiving sets to population in New Zealand is 49 per 1,000, and the country ranks third in the world in the number of telephones, with 100 per 1,000 of population.

South Africa.—JOHANNESBURG TELEPHONES.—It is reported that applications for telephones at Johannesburg are now so numerous that the supply of cable has been exhausted, and further consignments are awaited. Since March over 4,000 applications for new installations have been received by the Telephone Department.

Switzerland.—GENEVA-TOKIO RADIO-TELEPHONE.—According to *The Times*, a radio-telephone service between Geneva and Tokio is to be opened as the result of experiments made between the League short-wave station at Prangins and the Japanese short-wave station at Kamikawa, near Tokio. The service will be confined for the present to official conversations.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—January 10th. Post and Telegraph Department. Telephone jacks and number plates (A.X. 11580)* and loading coil pots (A.X. 11578).*
January 17th. Switchboard keys and parts (A.X. 11582)* and telephone bells and parts (A.X. 11583).*
January 24th. Resistances and reactances. (A. 11596.)*

Bridgwater.—November 28th. Corporation. Pumping machinery. Mr. E. A. Sandford Fawcett, 53, Victoria Street, S.W.1. (Deposit £5 5s.)

Coventry.—December 16th. Public Health Committee. Electrical installation at the New Infectious Diseases Hospital, Pinley. (See this issue.)

Dumfries.—November 29th. County Council. Switchboards for Dumfries, Annan and Lockerbie sub-stations. (November 18th.)

Edinburgh.—November 26th. Corporation. Various works in connection with the installation of new boiler plant and electric lifts at the Western General Hospital. City architect, City Chambers.

Glasgow.—December 7th. Education Department. Electrical work at Shawlands (New) Secondary School. Education Offices (Property Department), 129, Bath Street (£1 1s. deposit).

Leyton.—December 16th. Education Department. Electric lighting installation at Connaught Road School, Leytonstone. (See this issue.)

London.—November 28th. L.C.C. Tramway track, guard rails, tee rails, &c. General manager, L.C.C. Tramways, 23, Belvedere Road, S.E.1 (deposit £2).
ISLINGTON.—December 9th. Electricity Department. Mains extensions. (November 18th.)

New Zealand.—WELLINGTON.—January 10th. Post and Telegraph Department. 10,000 telephone transmitters. (A.X. 11587.)*

Northern Ireland.—BANGOR (Co. DOWN).—December 12th. Town Council. Electrically driven sewage pumping plant. Messrs. John Taylor & Sons, Caxton House, S.W.1 (deposit £5).
BELFAST.—December 5th. City Council. Electrically driven pump, with switchgear, &c. City Surveyor's Department.

Oban.—December 9th. Electricity Department. Generating station 11-kV switchgear. (November 18th.)

Rochdale.—December 1st. Electricity Department. Meters. (November 18th.)

Scone.—November 28th. Perth and Kinross Joint County Council Education Committee. Various works, including electric wiring and fittings and heating installation, at the new Douglas Memorial School. Mr. A. Watt Allison, architect, Education Offices, Perth.

West Midlands.—December 9th. Joint Electricity Authority. Static step-down transforming plant for the Ocker Hill generating station. (November 11th.)

Whitehaven.—Electric Supply Department. E.h.p. overhead line. (November 11th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Colchester.—Town Council. Accepted. Switchgear at the Hythe power station (£5,336).—Switchgear & Cowans, Ltd. Reconditioning of switchgear and cable work (£5,309).—Electric Construction Co., Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during October:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Motor alternators and generators.—Haslam & Newton. Electric cable.—Callender's; Connollys (Blackley); Enfield Cable Works; Derby Cables; G.E.C.; W. T. Glover & Co.; Hackbridge Cable Co. Electric travelling crane (1½ ton).—Cowans, Sheldon & Co. Welding resistances.—Allen West & Co. Switchgear and transformer.—English Electric Co. Wireless valves.—G.E.C.; Mullard Radio Valve Co.

WAR OFFICE.
Batteries for locomotives.—D. P. Battery Co. Dry paper-insulated cable.—Pirelli-General. Generators.—Electric Construction Co., Ltd. W/t sets and parts.—H. W. Sullivan.

AIR MINISTRY.
Electric cable.—Henley's. W/t Morse keys.—Siemens Bros. & Co. W/t valves.—Mullard Radio Valve Co. W/t short-wave receiver and wireless transmitting station equipments.—Marconi's. Transmitters.—Siemens Bros. & Co.

CROWN AGENTS FOR THE COLONIES.
Cables.—Callender's; Henley's. Telephone apparatus.—G.E.C. Wireless material.—Marconi's. X-ray apparatus.—Schall & Son.

POST OFFICE.
Telephonic apparatus.—Automatic Electric Co.; Ericsson Telephones; G.E.C.; Telephone Mfg. Co. Testing and protective apparatus.—Ericsson Telephones. Electric lamps.—A. C. Cossor. Cable.—B. I. Cables; Connolly's (Blackley); Hackbridge Cable Co.; Siemens Bros.; Telegraph Construction & Maintenance Co. Loading coils.—Automatic Electric Co.; G.E.C.; Standard Telephones & Cables. Telephone cords.—B. I. Cables. Motor-generators.—Small Electric Motors. Rectifiers.—Westinghouse Brake & Saxby Signal Co. Thermionic valves.—Ediswan. Laying armoured cable.—Perth-Dundee: J. F. Hodge; Bristol-Clevedon-Nailsea-Portishead: C. D. L. Construction Co. Cable manufacture, supply, drawing-in and jointing.—Stirling-Perth: Siemens Bros.; Perth-Dundee: Standard Telephones & Cables. Electric lighting and power wiring, Faraday building, E.C.—Electrical Installations. Rectifiers and transformers, Faraday building.—Bruce Peebles & Co. Telephone exchange equipment.—West End (Southampton area); Whitehall 2nd unit: Siemens Bros. Flaxman (London area: Glasgow trunk exchange: G.E.C. Sub-contractors for Glasgow: D. P. Battery Co. for batteries; Crompton Parkinson for motor generators; W. Jones & Co. for ringing machines. London toll "A" exchange: Standard Telephones & Cables. Bristol trunk exchange: Automatic Electric Co.
Telephone repeater equipment.—Marks Tey (Essex); Standard Telephones & Cables. Birmingham: G.E.C. Voice-frequency telegraph apparatus.—G.P.O. (West), E.C.: Glasgow: Standard Telephones & Cables.

H.M. OFFICE OF WORKS.
Lifts, Geological Museum, S.W.—Etchells, Congdon & Muir. Fuseboards, switches and fuses.—Revo Electric Co.

Hull.—Telephones Committee. Accepted. Cable (£291).—British Insulated Cables, Ltd. Switchboards (£33).—Telephone Manufacturing Co., Ltd.

Leeds.—Tramways Committee. Accepted. 4,500-A negative booster for Crown Point depôt (£1,321).—Greenwood & Batley, Ltd.
Electricity Committee. Accepted. Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£335); Macintosh Cable Co., Ltd. (£818).

London.—BATTERSEA.—Highways Committee. Recommended. Four three-way traffic signals (£309).—Automatic Electric Co., Ltd.

Macclesfield.—Rural District Council. Accepted. Installation of electric lighting in houses at Butley (£53).—Frank Wood and Co.

Middlesex.—County Council. Highways Committee. Accepted. Automatic traffic signals at Enfield (£449).—Automatic Electric Co., Ltd.

Portsmouth.—Tramways Committee. Accepted. 100 tons of tram rails.—Dorman, Long & Co., Ltd.

Preston.—Town Council. Accepted. Installation of automatic traffic signals (£8,326).—Barker & Colman.

Swinton & Pendlebury.—Urban District Council. Accepted. Installation of electric traffic signals (£81).—Wardle Engineering Co.

South Shields.—Education Committee. Accepted. Electrical installation at 120 flats, Green Lane (£470).—A. Eden.

Wakefield.—Housing Committee. Accepted. Electric lighting and heating at houses on the Eastmoor estate (£688).—H. Smith.

Forthcoming Events

Cardiff Engineering Exhibition.—November 23rd—December 3rd. Greyfriars Hall, Cardiff.

Chartered Institute of Patent Agents.—Friday, November 25th. Institution of Mechanical Engineers, London. 3.45 p.m. 50th anniversary meeting.

British Electrical Development Association.—Friday, November 25th. Caxton Hall, Westminster, S.W. 7.30 p.m. Two anonymous papers on "Electric Cooking." (*Northern Counties Area*).—Thursday, December 1st. Sopwith's Lounge, Newcastle-upon-Tyne. 7.15 p.m. "Street Lighting." Mr. W. J. Jones.

Television Society.—Friday, November 25th. Institution of Electrical Engineers, London. 6.15 p.m. Joint meeting with the Radio Society of Great Britain. "Television." Mr. T. M. C. Lance.

Association of Mining Electrical Engineers.—Saturday, November 26th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Notes on Repairing Trailing Cables." Mr. Ll. B. Atkinson.

Royal Society of Arts.—Wednesday, November 30th. Adelphi, W.C. 8 p.m. "Recent Developments in Electric Lighting." Mr. W. J. Jones.

Institution of Electrical Engineers.—Thursday, December 1st. Institution, London. 6 p.m. "The Relative Fuel Economy of Electricity, Gas, Oil and Solid Fuel as Heating Agents." Mr. A. H. Barker. (*South Midland Centre*).—Friday, November 25th. Grand Hotel, Birmingham. 7 p.m. Annual dinner. (*North-Eastern Students' Section*).—Friday, November 25th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Address by Mr. C. Turnbull. (*South Midland Students' Section*).—Saturday, November 26th. 3 p.m. Visit to works of Messrs. James Booth and Co., Ltd., Birmingham. (*Mersey and North Wales (Liverpool) Centre*).—Monday, November 28th. Adelphi Hotel, Liverpool. Annual dinner. (*North-Eastern Centre*).—Monday, November 28th. Hotel Metropole, Leeds. 7 p.m. "The Electrification of the Suburban and Certain Main-Line Sections of the Great Indian Peninsula Railway." Mr. F. Lydall. (*North-Western Centre*).—Tuesday, November 29th. Engineers' Club, Manchester. 7 p.m. "The Relative Fuel Economy of Electricity, Gas, Oil and Solid Fuel as Heating Agents." Mr. A. H. Barker. (*London Students' Section*).—Tuesday, November 29th. Victoria Hall, Southampton Row, W.C. 8 p.m. Dance. (*Meter and Instrument Section*).—Friday, December 2nd. Institution, London. 7 p.m. "The Technique of the High-Speed Cathode-Ray Oscillograph." Messrs. F. P. Burch and R. V. Whelpton. Saturday, December 3rd. Florence Restaurant, W. 7 p.m. Section dinner.

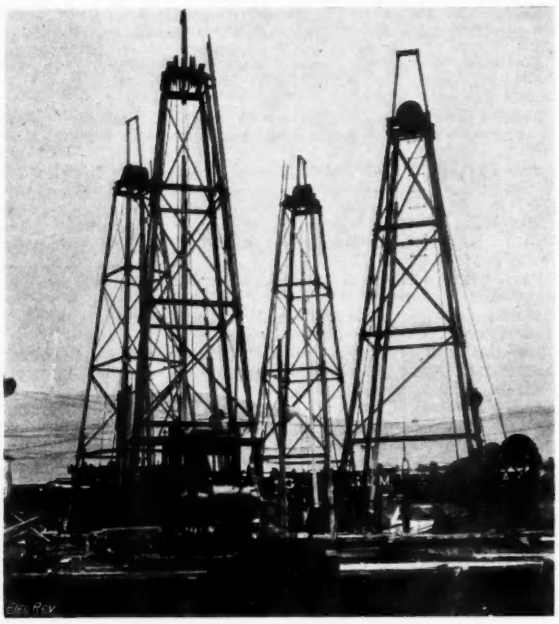
Physical Society.—Friday, December 2nd. Imperial College of Science, S. Kensington, S.W. 5 p.m. Short papers.

Notes

Large Bores at Swansea

The construction of the new foundations for the electric power station at Swansea necessitated the sinking of two vertical shafts, an intake shaft in the King's Dock area, and a discharge shaft in the Queen's Dock area, each 14 ft. in diameter. Owing to the water-logged nature of the underground strata the freezing process has been adopted. This process consists of consolidating the strata round about each shaft by freezing tubes placed in bore holes in the ground. During the process of insertion the freezing tubes are tested hydraulically at 200-lb. per sq. in. at frequent intervals, as there must be no leakage of brine. Two series of 24 boreholes were drilled 2 ft. 10½ in. apart on the periphery of a circle 22 ft. in diameter. During drilling operations boulders were met with, which tended to divert the borings from the vertical, but the full depth of 172 ft. was drilled with a deviation of only a few inches. The whole of the drilling operations were carried out by Messrs. LeGrand, Sutcliff & Gell, Ltd., artesian well engineers, Southall.

In addition, a pilot hole was first drilled to a depth of 250 ft. by the shot rotary method. The principal objects of the pilot hole were: to obtain accurate samples of the strata by means of cores; to enable the engineers to determine the correct depth of the ring holes; to enable the temperature of the



Drilling rigs at work at Swansea

ground to be taken during the freezing process; and to prove approximately what quantity of water would be met with below a depth of 170 ft. Four special boring rigs, designed by Messrs. LeGrand, Sutcliff & Gell, Ltd., were employed, the rigs being driven electrically by means of 30-h.p. motors.

Sequel to a Dog's Death

Judge Hyslop Maxwell (Bournemouth) recently gave his decision in an action brought by the owner of a dog which had been killed by coming into contact with a line charged at 230 V. The defendant had a son who was an electrician with the L.M.S. Railway Co., and he installed the wire in defendant's garden for the purpose of scaring away cats. The plaintiff claimed the sum of £50 for the loss of the dog—a wire-haired terrier

In his judgment, His Honour expressed the view that although the action which had been taken by the defendant's son was an undesirable practice, the dog was a trespasser, and judgment must be given in favour of the defendant.

Indian Electric Railway Progress

The latest report of the Indian Railway Board, in summarising progress on the combined Great Indian Peninsula electrification scheme, observes that "the electrification of the main line and suburban sections of this railway is the second largest electrification in the British Empire, and is well placed in importance amongst similar schemes throughout the world." Passenger locomotives working throughout the electrified area from Igitpuri to Poona, *via* Kalyan (48 miles from Bombay) came into operation on September 1st, 1930. Throughout the year (1930-31) 271¼ miles of 110-kV single-circuit transmission lines have been placed in full commission for supplying power to eleven sub-stations in the electrified area beyond Kalyan. Fifteen traction sub-stations with a total capacity of 100,000 kW (normal rated output) are now in commission.

Four new sub-stations were put into service during the year. There are now 571 single track miles of overhead equipment in service. In addition to the original passenger locomotives which were under trial, twenty-one new locomotives were put into operation. Besides these forty-one electric freight locomotives are now in service. Power is received from the Tata Hydro-Electric Power Company and from the Kalyan power station. An important development during the year has been the electrification of the suburban services of the South Indian Railway for eighteen miles from Madras to Tambaran, which is the first metre gauge line in India to be electrified. A pressure of 1,500 V d.c. is employed; the rail and not the trolley line is the positive conductor.

The combined G.I.P. electrification system offers instructive examples of the application of electric power to railway traction under varying circumstances. The Bombay, Baroda and Central India Railway electrification also has its peculiar problems; the electrification of the South Indian Railway section was not merely the conversion of existing steam operated lines to electric working, but included the construction of new tracks and stations to accommodate suburban traffic that had increased so much as to impede the main line services.

Hydro-electric Developments in Madras

In his report for 1931-32, Mr. H. G. Howard, chief engineer of the Department of Hydro-Electric Development of the Government of Madras announces that the Pykara scheme is in its final stages and that two of the three generating units are expected to be ready for service before the end of the year, by which time the main transmission and distribution networks should be completed. Except for the customs duties imposed by the Finance Bill of 1931, it is believed that the original estimates will not be exceeded. Load surveys and investigations into other water-power schemes are proceeding. Nearly 1¼ million kWh was generated by the Glen Morgan scheme, the m.d. being 622 kWh.

The South Indian Railway is taking a supply at 22 kV from the Mettur-Erode-Salem scheme. The Government accepted Mr. Howard's recommendation to institute a conversion fund, from which loans could be advanced to industrialists for electrifying their factories and to small agriculturists for installing electric pumps. The maximum loan allowed is Rs. 25,000, but larger amounts are to be considered. A policy of hire-purchase is to be pursued to speed up electrification. Mr. Howard considers that the conditions are propitious for an electrical drive and that if a progressive policy be pursued Madras is likely to outstrip other Indian provinces. As the use of electricity develops the need of a central controlling body will make itself increasingly felt. A proposal to organise a new commercial section was abandoned in deference to the retrenchment policy of the Government. The work is now carried out by the chief engineer, his personal assistant, and a junior commercial engineer for field work.

A Non-rusting Aluminium Alloy

A good deal of attention is just now being devoted in France to an aluminium alloy known as "Thalassal," which has recently been introduced into that country and is claimed to be non-rusting, due to the chemical constituents of the alloy and particularly to the presence of antimony which, when the alloy is subject to the action of alkaline solutions, gives rise to a thin coating of oxy-chloride of antimony. Castings made from it are stated to be able to withstand rupturing tests up to from 30 to 42 lb. per sq. mm., to have an elastic limit of from 19½ to 24 lb. per sq. mm., while the Brinell hardness member ranges from 55 to 65. For rolled material the rupture tests vary from 39½ to 44 lb. per sq. mm.; the elastic limit is 28½ lb. per sq. mm., and the hardness number 50.

Mercury Power Plant

The construction of an unusual power plant to cost some $4,000,000 is being undertaken at Schenectady, N.Y., by the American General Electric Company. Perhaps the most unusual feature is that a mercury boiler and turbine will be used, although no little interest is attached to the fact that it is to be the first outdoor steam-electric generating plant. The mercury turbine is rated at 20,000 kW, and the station at 25,000 kW, as there is also a 50,000-kW non-condensing steam unit. By-product steam will be secured from the mercury condenser; a steam boiler also will be included in the outdoor station. The electrical energy generated by the plant will be supplied to the commercial system of the New York Power and Light Corporation, while the steam output will be used in the General Electric works. The mercury vapour will be at a temperature of 958 deg. F. and 125 lb. gauge; the steam will be at 760 deg. F. and 410 lb. initial pressure. *Electrical Engineering* reports that the plant is expected to be ready for operation in the spring of 1933.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

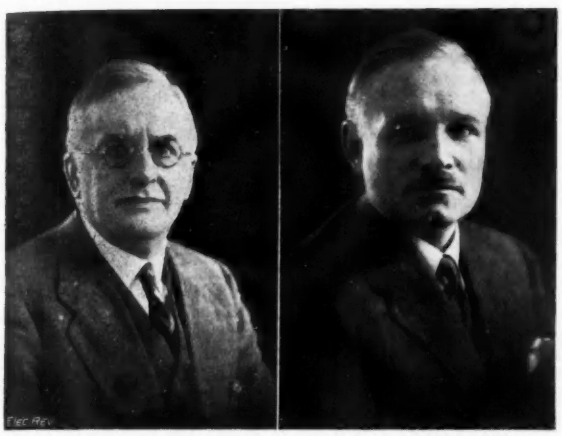
We shall be glad to learn the names and addresses of the makers of the following:—

Coppered iron reflectors for bowl fires (from 7 to 10-in. diameter).
Brassed iron wire.
Rectangular strip.
SLIPPON reflectors.
MARVEL curling heater.
NEWTOWN taper charger for batteries.
LINLEY universal lamp.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir Alexander Gibb, G.B.E., C.B., M.Inst.C.E., has accepted the invitation of the Council of the Junior Institution of Engineers to become president of the Institution in succession to **Dr. S. L. Pearce,** C.B.E., His induction will take place at a meeting to be held at the Royal Society of Arts on December 9th, when he will deliver his address entitled "The Future of Water Power in Great Britain."



Messrs. E. W. Dickinson and H. W. Grimmitt, whose paper on "The Design of a Distribution System in a Rural Area" was read before the North Midland Centre of the I.E.E. on Tuesday

Dr. N. W. McLachlan, D.Sc., Eng. (Lond.), M.I.E.E., who opened the discussion on "Loud Speakers" at the informal meeting of the Institution of Electrical Engineers last Monday, designed the moving-coil loud speaker in this country in 1925, and demonstrated it to the Radio Society of Great Britain in January, 1926. A replica is now in the Science Museum. He also designed the "Amplion Lion" loud speaker in 1926, involving a new principle in the construction of reed-driven loud speakers where a linear relationship was obtained between the current and the deflection of the reed for the first time; a replica of this is also in the Science Museum. The first loud speaker which he devised was of the electrostatic type and the ideas therein form the basis of certain speakers and of microphones. A microphone of this type was used in the 1922 transmissions from "2LO," Marconi House. He was responsible for the studio arrangements of the first broadcasts from Marconi House, and gave a lecture before the I.E.E. at Birmingham in 1923 on the old short-horn type of loud speaker. He is the author of a book entitled "Wireless Loud Speakers," and of numerous articles and papers on the subject. He dealt with loud speakers in an article contributed to our issue of January 22nd last.

[Press Portrait Bureau

Dr. N. W. McLachlan

Mr. L. D. Gunnell, who for some years was manager of the Birmingham branch of the Foster Engineering Co., Ltd., has now been appointed London manager, and the management of the Birmingham branch has been taken over by **Mr. S. Farmer.**

Col. J. S. Ruston, chairman of Messrs. Ruston & Hornsby, Ltd., and **Mr. R. E. Trevithick,** assistant general manager of Messrs. Dewrance & Co., have been elected to serve on the Council of the British Engineers' Association for the ensuing year.

Mr. R. P. Hilton, A.M.I.E.E., has recently joined the staff of Messrs. Bruce Peebles & Co., Ltd., Edinburgh, as chief sales engineer.

M. Louis Leon Astier, chief engineer of the Compagnie Parisienne de Distribution d'Electricité, has lately been appointed a Chevalier of the French Legion of Honour as a mark of appreciation of his long service with that undertaking (nearly 22 years) and of his work in connection with the electric lighting of the 1931 Colonial Exhibition in Paris.

Mr. L. W. Farrow has joined the board of Indeuram, Ltd., and has been elected chairman to fill the vacancy caused by the death of Sir John Ferguson.

Mr. A. V. Mason, engineer and deputy general manager of the tramways group of the Underground combine, has relinquished the control of the Sutton and district electricity supply undertaking upon its acquisition by the London and Home Counties Joint Electricity Authority. At a gathering of the staff of the undertaking recently to bid him farewell he was presented with an easy chair, while Mrs. Mason received a scent spray. Mr. R. J. Denman, the resident manager at Sutton, briefly reviewed the progress of the undertaking during Mr. Mason's twenty-five years' association with it. Mr. Mason thanked the staff for the way in which they had assisted him and for their continued loyalty.

Mr. A. V. Mason: An "Electrical Review" photograph taken at the Transport Congress in May last

Obituary

Mr. Ll. Jones.—The death occurred suddenly on November 10th, at the age of 53 years, of Mr. Llewelyn Jones, who was in business as an electrical contractor at Newtown, Mont. He had carried out numerous contracts, including installations at the new wards of the county infirmary, and at the county pavilion.

Mr. B. Pennock.—The death is reported of Mr. Burton Pennock, which occurred at his home in Enfield at the age of 61. He retired from the Edison Swan Electric Co., Ltd., about sixteen months ago owing to ill-health, after 43 years' service with the company.

Mr. J. A. Hoffe.—The death has occurred of Mr. J. A. Hoffe, for many years superintendent of telegraphs and telephones, South African Government Railways, at Johannesburg.

Will.—Mr. M. L. Slattery, the late general manager of the West Ham Corporation tramways, left £9,857 (net personalty £9,825).

An Electric Lamp Hotbed

A HOTBED of about four by six feet, heated and lighted by nothing more than eight 25-W lamps, produced last winter some hundreds of strong and healthy flower and vegetable plants ready for transplanting into the gardens in early spring when the neighbours were beginning to plant seeds in the open.

A simple and inexpensive electrical hotbed of this kind provides a unity power-factor load, mostly at night. It can be installed in a dark backyard near a garage, whereas a sun-porch hotbed would always take useful space in the garden, and a manure hotbed could not be relied upon on cold nights.

An installation was recently described in detail by Robert L. Zahour in the *Electrical Journal*. The box of this bed was 10 in. high; its outer sides were covered to one-half of the height by earth. The top screen consisted of a rigid wood frame with two layers of glass having a ¾-in. air pocket between them, the latter greatly assisting in conserving the heat in the bed. The lamps were mounted on the underside of a couple of wooden strips laid across the top of the box, four lamps on each strip with 12-in. centres. The top edge of the box was evenly covered with wool-fibre weather stripping, making an air-tight joint when the top screen was laid upon it and held fast by hooks. *Vacuum* lamps were used, because gasfilled ones, which localise 20 per cent. of their heat by gas-convection, would have eventually produced local hot spots within the bed.

A thermostat was arranged to turn on the lamps when the air temperature in the hotbed dropped below 10° C. Seeds were planted in this bed on February 27th. On April 15th the last plants (which included almost all the more common flowers and garden vegetables) were ready for planting out, all strong and healthy, although the outdoor temperatures in this period had sometimes dropped as low as 9 deg. C., while the temperature within the box had sunk to 5.5 deg. C., as indicated on a recording thermometer. The total consumption of electricity throughout this period was about 15 kWh.

Quoting for Export.

By Frank Small, Grad.I.E.E.

Problems presented by distant markets

HOW often the overseas buyer looks on a quotation in disgust. Invariably there is something lacking, although he distinctly points out in his inquiry that certain definite information is required. This, unfortunately, appears to be an inherent fault when dealing with overseas business, probably because it is a specialised line with which the average tenderer is not always familiar. A few elementary notes on the subject may therefore be useful.

The "layout" of the tender depends to a large extent on the type of gear or the class of material being quoted for, but, in general, it is desirable for the quotation to be concise rather than lengthy. It must be borne in mind by the sales engineer that his customer may be many thousands of miles away and if any point is not clear the matter has to be referred home again, and many weeks are lost. On the other hand it may mean needless expense in sending cablegrams: such delay often results in the loss of an important order.

In the case of many indent houses in London the buyer usually requires a quotation in duplicate or triplicate so that one or more copies may be sent to his principals overseas. This saves unnecessary copying and also ensures that the principals are furnished with all the information put forward by the supplier. If an additional air mail copy is required it should be made out on special paper provided for the purpose, but if this is not available ordinary flimsy paper (typed on both sides) is quite satisfactory.

Shipping Details

The most important point to be remembered is the shipping specification, whether the quotation covers f.o.b. home port or c.i.f. foreign port. In the former case it is obvious that the buyer must be provided with weights and measurements in order to calculate the freight charges, but it is not always understood that in both cases the same information is required in order to arrive at the landed cost. For instance, a cargo consigned to a South African port may be railed several hundred miles before it reaches its final destination at a mine in the neighbourhood of Johannesburg. The term "packing extra at cost" is obviously far too indefinite, and, from previous experience, any manufacturer should be in the position to quote a definite f.o.b. figure, which, of course, should include packing charges and all incidental costs, freight to docks, shippers' charges, dock dues and bills of lading. For medium and heavy gear manufacturers often take an all-round figure of 5 per cent. on the normal selling price which covers all these charges.

Terms of payment should be clearly stated. For instance, a five per cent., or even smaller, cash discount for payment against shipping documents is an inducement and has a definite bearing on the overseas landed cost, especially as buying offices and overseas agents usually work on a small percentage profit. It is important that the despatch date quoted should be definite rather than approximate, as in the event of the material or apparatus being urgently required it might be necessary for the importer to allow for the mail steamer freight (when calculating c.i.f. charges), which is more expensive than intermediate steamer freight. Quotations should be submitted within the time specified whenever possible, as details are often required for overseas mailing on a certain day and many mails leave this country once a week only.

Catalogues and Tariffs

With regard to descriptive matter it may be said with regret that the majority of English catalogues cannot be compared with American bulletins and the complete manner in which Continental catalogues are prepared. Nevertheless, descriptive matter and general data should be enclosed with the tender wherever possible, at least in duplicate. If the goods are not of British origin the name of the country in which they are manufactured should be given. In these days of preferential tariffs the country of origin often affects the import duty, which, of course, varies the landed cost.

While these notes are for the tenderer, it must not be overlooked that inquiries are often somewhat vague, especially when instructions and specifications are issued by typical colonial buyers. In these cases it is incumbent upon the tenderer to do his best in the circumstances and submit what he considers the most favourable offer.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Richardsons Westgarth-Brown Boveri, Ltd.—Private company. Registered November 21st, with a nominal capital of £10,000 in £1 shares. Objects: To act as selling agents in Great Britain and elsewhere for any person, firm or company in any part of the world, to carry on business as marine, electrical, mechanical and general engineers, suppliers of electricity, iron, steel and brass founders and workers, &c., and to adopt agreement (1) with Richardsons Westgarth & Co., Ltd., and (2) with A. G. Brown Boveri & Cie. The first directors are: R. S. Middleton, 52, John Street, Sunderland (chairman); G. Robson, 134, Bedford Court Mansions, Bedford Square, W.C.1; M. G. S. Swallow, Drewton, Park Road, West Hartlepool, engineer; S. W. Brown, Langmatt, Baden (director of Brown Boveri & Cie.); and A. C. Eborall, 20, Queen's Road, Kingston Hill. The first three named are nominees of Richardsons Westgarth & Co., Ltd., and S. W. Brown, A. C. Eborall, and R. J. F. Vodoz are nominees of A. G. Brown Boveri & Cie. Registered office: Hartlepool Engine Works, Hartlepool.

Rex Radio Corporation, Ltd.—Private company. Registered November 5th. Capital £2,200 in £1 shares (2,000 preferred ordinary and 200 ordinary). Objects: To carry on the business of manufacturers of and dealers in all kinds of apparatus for the recording and reproduction of sound or light, radio and wireless sets, &c. The directors are: D. M. Gilbert, 11, Alberstone Road, Brondesbury, N.W., and C. Fonteyn, 74, Duke's Avenue, Chiswick, W.4. Registered office: 34, London Wall, E.C.

New Process Welders, Ltd.—Private company. Registered November 16th. Capital £2,000 in £1 shares. Objects: To acquire the business known as New Process Welders carried on by W. J. Gladitz, F. C. Hohrs, and Dr. H. Eisinach upon the premises of New Process Co., Ltd., at Scotts Road, Southall; to acquire, develop, and vend certain inventions for electric welding; to manufacture and deal in welding machines, &c. The first directors are: W. J. Gladitz, 20, Audley Road, Ealing, W.5; F. C. Hohrs, 8, The Green, Heston, Middlesex, engineer; and A. Jourdan, 3, Thyra Grove, Finchley, N.12. Registered office: Scotts Road, Southall.

Eldeco Radio, Ltd.—Private company. Registered November 17th. Capital £4,000 in 3,000 5 per cent. cumulative preference shares of £1 and 20,000 ordinary shares of 1s. each. Objects: To acquire the business of an electrical and mechanical engineer carried on by D. E. Barnett at 62, Conduit Street, W., to manufacture and deal in gramophones, radio sets, &c. The life directors are: D. E. Barnett, 10, Tregunter Road, S.W.10; and J. R. Coats, Dumbreck, Bromley Common. Registered office: 62, Conduit Street, W.

Berdaco Trust, Ltd.—Private company. Registered November 17th. Capital £600 in 1s. shares (4,000 "A" and 8,000 "B"). Objects: To acquire patents and to carry on the business of electricians, electrical and mechanical engineers and specialists in and designers of all kinds of electrical and mechanical plant, &c. The directors are: H. Martin, 24, Inglis Road, Ealing Common, W.5; and R. O. Mitchell, 81, Beulah Hill, S.E.19. Registered office: Moorgate Hall, Moorgate, E.C.2.

C.E.L., Ltd.—Private company. Registered November 18th. Capital, £250 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and wireless apparatus, &c. The directors are: J. Ismay, 108, Westbourne Terrace, W.2, and R. Terrell, 24, Queen's Avenue, N.10.

Slane & Co., Ltd.—Private company. Registered November 17th. Capital £550 in £1 shares (500 10 per cent. cumulative preference and 50 ordinary). Objects: To carry on the business of manufacturers of and dealers in electrical and wireless apparatus, &c. The subscribers are: C. G. Slane and I. Slane, both of 4, Doneraile Street, Fulham, S.W.

Brockley Radio, Ltd.—Private company. Registered November 11th. Capital £3,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in gramophones, sound reproducing machines, electrical accumulators and general wireless and electrical components, &c. The directors are: W. E. Band, 63, Overcliff Road, Lewisham, S.E.13; and L. A. Mitchell, 61, Court Farm Road, S.E.9. Registered office: 286, High Road, Lee, S.E.13.

Car-Radios, Ltd.—Private company. Registered November 19th. Capital, £1,000 in 5s. shares. Objects: To enter into an agreement with J. Sokolov and A. Klatsko for the sale of an invention relating to radio apparatus. The permanent managing directors are: J. Sokolov, 135, Amhurst Road, E.8; A. Klatsko, 136, Amhurst Road, E.8.; and A. L. Rye, 13, Golden Square, W.1. Registered office: 13, Golden Square, W.1.

Synba Electric, Ltd.—Private company. Registered November 18th. Capital, £800 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in electrical, wireless and scientific apparatus, &c. The directors are: C. G. Barnett, 11, Corringway, Ealing, W.5; L. Neil, 62, Twyford Avenue, Acton, W.3; and W. F. S. S.

Symes, 31, St. George's Road, S.W.1. Registered office: Parliament Mansions, Orchard Street, S.W.1.

F. W. Smuthwaite, Ltd.—Private company. Registered November 19th. Capital, £2,000 in £1 shares. Objects: To acquire the business of a wireless, gramophone and electrical apparatus manufacturer, carried on by F. W. F. Smuthwaite at Harmony Works, Ross Parade, Wallington, Surrey. The permanent directors are: F. W. F. Smuthwaite and Alice M. Smuthwaite, both of 15a, Onslow Gardens, Wallington, Surrey. Secretary: Mrs. A. M. Smuthwaite. Registered office: Harmony Works, Ross Parade, Wallington, Surrey.

Returns of Electrical Companies

Armature and Engineering Co., Ltd.—Debenture dated November 4th, 1932, to secure sums not exceeding £125 which the chargee may be called upon to pay under a guarantee to company's bankers. Property charged: The company's undertaking and property, present and future, including uncalled capital. Holder: A. Roxburgh, Clandown House, Clandown, Radstock, Somerset. Also debenture of same date to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital, if any. Holder: Mrs. H. Roxburgh, Clandown House, Clandown, Radstock, Somerset.

Elkay Electrical Manufacturing Co., Ltd.—Capital £1,000 in £1 shares. Return dated June 30st, 1931 (filed June 30th, 1932). All shares taken up. £1,000 paid. Mortgages and charges, nil.

Colombo Electric Tramways & Lighting Co., Ltd.—Capital £150,000 in £10 shares. Return dated June 7th, 1932. 13,084 shares taken up. £840 paid. £130,000 considered as paid. Mortgages and charges, nil.

British B.A.G., Ltd.—Capital £12,000 in £1 shares. Return dated June 4th, 1932. All shares taken up. £9,000 paid. £3,000 considered as paid. Mortgages and charges, nil.

Potteries Electric Traction Co., Ltd.—Capital £600,000 in £1 shares. Return dated June 10th, 1932. 224,750 shares taken up. £211,418 paid. £13,332 considered as paid. Mortgages and charges, £346,389 9s.

Ellesmere Port Electrical Co., Ltd.—Capital £500 in £1 shares. Return dated June 17th, 1932. 450 shares taken up. £251 paid. £199 considered as paid. Mortgages and charges, nil.

Malmesbury Electric Supply Co., Ltd.—Capital £6,000 in 3,000 preference and 3,000 ordinary shares of £1. Return dated June 28th, 1932. 1,945 preference and 2,800 ordinary shares taken up. £4,745 paid. Mortgages and charges, nil.

British Battery Co., Ltd.—E. V. Amsdon, 22, Walbrook, E.C.4, ceased to act as receiver and manager on November 4th, in respect of two appointments.

Terrytone Radio Products Co., Ltd.—Debenture, dated October 31st, 1932, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. McBlain, 20, Upper Hornsey Rise, N.19.

Launceston and District Electric Supply Co., Ltd.—Satisfaction to the extent of £2,500 on October 1st, 1932, of debentures authorised June 25th, 1924, and registered June 2nd, 1925. (According to the register of mortgages, the debentures registered June 2nd, 1925, originally secured £3,500 and bonus of 4 per cent.)

Spencer Radio, Ltd.—E. Haves, 107, Bounds Green Road, Bowes Park, N.22, was appointed receiver on November 16th under powers contained in debenture dated August 8th, 1932.

Wilrose Co. (Birmingham), Ltd.—Capital £100 in £1 shares. Return dated September 22nd, 1932. 75 shares taken up. £75 paid. Mortgages and charges, nil.

British Electric Meters, Ltd.—Capital, £50,000 in £1 shares. Return dated June 10th, 1932. 25,000 shares taken up. £17,650 paid. £7,350 considered as paid. Mortgages and charges, nil.

Waldron Electrical Manufacturers, Ltd.—B. Baddiel, Northampton Place, Swansea, was appointed receiver and manager on November 16th, under powers contained in charges dated May 8th and June 2nd, 1932, and May 11th, June 17th, and July 14th, 1932.

Wireless Services, Ltd.—Particulars filed of debentures for £5,000 and premium of 5 per cent., authorised November 3rd, 1932, charged on the company's undertaking and assets, including uncalled capital, the amount of the present issue being £200.

A. E. Chesters, Ltd.—Mortgage dated November 3rd, 1932, to secure £250, charged on 2, Atherton Street, and 160, Victoria Road, New Brighton, Wallasey. Holders: Mrs. O. Nevett, Forcett Vicarage, Aldboro' St. John; and J. R. Joyson, 11, Lord Street, Liverpool.

City Notes

The North-Eastern Electric Supply Co., Ltd., is to make an issue of 708,000 ordinary shares of £1 each at 23s. 6d. per share. The new shares will be offered to shareholders in the proportion of one new share for every eight shares (5 per cent. preference and ordinary) held. They will participate *pari passu* with the existing ordinary shares as from January 1st next. They will not participate in any final dividend payable in March next in respect of the current year. The new capital is required in connection with the expansion of the company's business. In making the offer the company states that the connections to its system at the end of 1931 totalled 785,688 h.p., an increase of 32,888 h.p. as compared with the preceding year. During the current year an addition of 20,000 h.p. has been connected and orders for supplies in hand at the present time total 27,665 h.p.

S. Smith & Sons (Motor Accessories), Ltd., held their annual meeting on November 22nd. Mr. W. Henderson Cleland (chairman), who presided, in the course of his speech said the result of the trading had been an increase in profit for the year of over £10,000. Their subsidiary companies had done satisfactory business during the year. Progress had been made with the development of that part of their business dealing with English domestic clocks. They had established already a world-wide reputation for their electric clocks, and to-day, so far as they could judge, over 50 per cent. of the synchronous clocks sold in this country were of their make. In the course of the development of their English clocks they had discovered that, in addition to the important home market, there was a considerable demand overseas.

The Cape Electric Tramways, Ltd., report a profit for the year ended June 30th last of £36,572, against £34,269 for 1930-31. After deducting debenture interest, &c., there is a balance of £12,671, which with £40,332 brought in makes £53,003. When Great Britain went off the gold standard the company had sterling balances in London, and to cover the fall in value of these it is necessary to provide £2,239, leaving a balance of £50,764 to be carried forward. A sum of £706,618 has been withdrawn from depreciation reserve to write down the value of investments in, and advances to, subsidiaries.

The East India Tramways Co., Ltd., reports a net revenue for the year ended July 31st last of £12,915 (against £16,003), to which is added £674 brought in, making £13,589. It is proposed to place £1,500 aside for income tax, and to pay dividends of 5 per cent. on the preference and ordinary shares and 9 per cent. on the deferred shares (against 10 per cent.), leaving £1,044 to be carried forward.

The Buenos Aires Town & Docks Tramways, Ltd., reports net receipts for the year ended June 30th of £25,226, as compared with £33,540 in the preceding year. The net profit was £23,079, to which is added £4,123 brought in, making £27,202. Renewals reserve receives £20,000, and it is proposed to pay a dividend of one per cent. for the year (same), leaving £2,252 to be carried forward.

The Electric Supply Corporation, Ltd., proposes to increase its capital from £500,000 to £750,000 by the creation of 250,000 new shares of £1 each, in order to provide additional funds for the expansion of the business. The proposal is being submitted to an extraordinary general meeting which is being held to-day (Friday).

Companies Struck Off the Register.—The names of the undermentioned companies have been struck off the Register and they are thereby dissolved:—

Sale Electric Co., Ltd.
Southern Wireless, Ltd.
Wholesale Electric Supply Stores, Ltd.

The Canadian General Electric Co. has announced a quarterly dividend on the common stock of $1 per share.

The Yorkshire (West Riding) Electric Tramways, Ltd., recommends a final dividend of 3 per cent. on the 6 per cent. cumulative preference shares.

The Consolidated Gas, Electric Light & Power of Baltimore has declared a dividend of 90 cents per share on the common shares for the quarter ended December 31st.

The Hendon Electric Supply Co., Ltd., has placed privately an issue of 46,536 £1 ordinary shares, bringing the capital up to £380,000.

The Pennsylvania Water & Power Co. has announced a quarterly dividend of $\$\frac{3}{4}$ per share on the common shares (same).

Grosvenor Electric Batteries, Ltd.—It is reported that the recent offer of 20,154 new £1 ordinary shares at par was considerably over-applied for.

The Rhondda Tramways Co., Ltd., reports a gross revenue for 1931 of £73,349. After providing for debenture and other interest, &c., there is no balance on net revenue account, and the loss of £3,100 brought in is again carried forward.

The Radio Corporation of America reports a gross income for the third quarter of the current year of $14,254,637, making the total for the nine months $50,796,800, and a net income for the respective periods of $665,197 and $4,263,705.

J. V. Brittain & Co., Ltd.—The nominal capital has been increased by the addition of £1,250 beyond the registered capital of £1,100. The additional capital is divided into 1,250 6 per cent. preference shares of £1 each.

Remax, Ltd.—The nominal capital has been increased by the addition of £17,000 beyond the registered capital of £3,000. The additional capital is divided into 17,000 ordinary shares of £1 each. Each of the 20,000 £1 shares is to be sub-divided into two shares of 10s. each.

High Tension Wires, Ltd.—The nominal capital has been increased by the addition of £2,900 beyond the registered capital of £100. The additional capital is divided into 1,000 6 per cent. cumulative preference and 1,900 ordinary shares of £1 each.

Stocks and Shares

TUESDAY EVENING.

EVEN the Electric Supply market was not able to keep quite aloof from the general malaise which swept over the Stock Exchange in the course of this week, and although business was fairly active and price movements far from serious, the majority of them were downwards. County of London at 50s. 6d., Metropolitan at 47s., Northamptons at 48s. and Yorkshires at 39s., all lost the turn, and North Eastern ordinary were also down at 27s., but at this price they are "ex" the rights to the new issue. The "rights" are to apply for one new ordinary share at 23s. 6d. for every eight old ordinary or 5 per cent. preference held. These shares will rank for the full dividend as from January 1st next, but do not participate in the final dividend payable on account of the current year, and dealings in them opened yesterday at 2s. 3d. premium, from which level they subsequently slipped back somewhat to 1s. 10½d. premium. At this price they give a return on the current 6 per cent. rate of distribution of 4¾ per cent., and are for the moment free of stamp and fee. The other bulk supply ordinaries—Clyde Valley, Lancashire Electric, Midland Counties and Scottish Power—were unchanged.

The London group were not as active as during the previous week, but the tendency of prices was again to harden up, and there are very few shares now on offer under 34s. Even those actually on offer are in very small quantities. Price movements in the debentures of the whole group were few and far between, and the same can be said of the stocks of the Central Electricity Board and the various Joint Electricity Authorities.

Of the distributing companies, Hendon Electric Supply Company placed privately a block of just over 45,000 shares, in which, for a couple of days, active dealings took place at 85s. A new issue is expected in the near future of Electric Supply Corporation. British Power & Light ordinary continued to be in demand by those to whom immediate income is not a necessity, and there were markings each day around 15s. 6d. The 6 per cent. preference were fractionally off colour at 24s. 3d. Edmundson's Electricity 6 per cent. preference continued to be one of the most active items on the preference list, the price remaining almost stationary, however, at 25s. 3d. On account of its return of nearly 4¾ per cent., Electrical Finance & Securities ordinary at 53s. have been sought after, and a moderate-sized parcel of shares very soon found buyers. Llanellys were bought two or three times between 19s. and 19s. 6d. on hopes of a dividend for the current year in excess of the 4 per cent. paid for 1931. Others of the lesser known companies to be dealt in were North Somersets at 31s. 6d., Newcastle & Districts at 30s. 3d., and Richmond Electric Supply at 49s. 6d.

Overseas Securities

In the Overseas market the recently placed preference and ordinary shares of the East African Electric Co. have been quietly absorbed, but supplies are still available at 26s. 6d. for the preference and 28s. for the ordinary, both free of stamp. Madras Electric new ordinary were in enquiry at 34s. 6d., but Calcutta Supply ordinary were somewhat on the dull side, shares changing hands at 49s. It is not generally realised that, without exception, all the big lighting companies in India have, during the last ten or twelve years, shown uninterrupted progress, and the shares of this group are well worth the attention of those requiring a yield somewhat higher than can be obtained on the home variety. In common with most things Japanese, Tokyo Electric 6 per cent. bonds were a distinctly dull spot, marking as low as 62½, a drop of about 5 points on the week. As interest and sinking fund is payable at the option of the holder in dollars in lieu of sterling, at this price the yield is not far short of 15 per cent.

Dull Transport Market

A glance at a list of prices of Home & Foreign Tramways showed an almost complete absence of price movement, from which it will be clear that this section of the market was very uninteresting. There was a little life, however, in the London group, and quite a small amount of buying of London and Suburban Traction preference put the price up to 12s. bid. London United Tramways preference and debenture were stationary, but, curiously enough, Underground ordinary themselves were down to 19s., although probably the reason for this is sympathy with the ordinary stocks of the main line railways, which were inclined to be heavy on last week's traffics, which were a little worse than was generally hoped for. The 7½ per cent. return obtainable on Torquay Tramways continues to attract buyers, as the shares marked 32s. practically every day.

Another high yield in the traction section is the 7½ per cent. cumulative preference of the Provincial Tramways Company, in which business was done at 16s., showing a return of over 9 per cent. on the money invested. The unexpected announcement of a 2½ per cent. dividend in South African currency on the ordinary shares of the Cape Tramways Company caused a little enquiry and appreciation in the price to 11s. 6d. There was no change in the quotations of the securities of the Anglo-Argentine Tramways Company, although there was a mark of 40½ in the 4 per cent. first debenture stock and 8½ in the 5 per cent. debenture. The preference do not appear to have changed hands, but the £5 ordinary shares of the City of Buenos Ayres Tramways Company were dealt in at 2¼. This is the company which owns a rent charge of the Anglo-Argentine Tramways Company, and has, since its formation, paid regular dividends of 5 per cent. per annum on its ordinary shares.

In General

During the last few days the Stock Exchange has been in a distinctly unhappy frame of mind. The trouble commenced, of course, with the recent 3 per cent. Conversion Loan, which was very heavily stagged, dealings opening at a discount. This set the ball rolling and bulls of all British Government stocks immediately started profit-taking, with the result that a general all-round drop in quotations took place, especially in the irreducible stocks. The American debt question, which has again come to the fore, is also having a distinctly disturbing influence, as there is nothing the Stock Exchange abhors more than uncertainty; so that, whereas a week or so ago things were, comparatively speaking, happy, now every point is a bear point. Markets are likely to continue in a distinctly touchy state until after the Government financing is finished on December 1st and until something definite is known as to the future of the European war debts due to the U.S.A.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Approx. Dividend. 1930.	1931.	Price, Nov. 22	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	70/–	–1/3	4 5 9
Brompton Ordinary	1	8½	8½	33/–	+2/–	4 4 10
Central Electricity 4½% Deb.	Stock	4½	4½	104½	+½	4 6 2
Charing Cross Ordinary	1	8½	8½	33/6	+6d.	4 3 7
Chelsea	1	8½	8½	33/6	—	4 3 7
City of London	1	10	10	45/6	—	4 7 11
Clyde Valley	1	8	7	32/–	—	4 7 6
County of London	1	11	10½	50/6	–9d.	4 3 2
Edmundsons' 7% Pref.	1	7	7	30/–	—	4 13 4
Elec. Dis. Yorkshire	1	9	9	41/3	—	4 7 4
Elec. Supply Corporation	1	11	11	55/–	—	4 0 0
Kensington Ordinary	1	8	8	33/6	—	4 3 7
Lancs. Light and Power	1	6½	7	29/3	—	4 15 9
London & Home Counties 4½% Deb.	Stock	4½	4½	107	—	4 4
London Electric	1	9	9	33/6	+6d.	4 3
Metropolitan	1	10	10	47/–	–1/9	4 7 0
Midland Counties	1	7	7	33/9	—	4 3 0
Mid. Elec. Power	1	8	8	35/9	—	4 9 5
North Eastern Electric Ordinary	1	6	6	27/–xd.	–1/–	4 12 4
Do. 7% Pref.	1	7	7	31/6	—	4 9 0
Northampton	1	10	10	48/–	–9d.	4 3 4
Notting Hill 6% Pref.	10	6	6	12½	—	4 16 0
North Met. Elec. 6% Pref.	1	6	6	29/6	—	4 1 4
St. James' and Pall Mall	1	8	8	33,6	+6d.	4 3 7
Scottish Power	1	8	8	33/9	—	4 14 10
South London	1	8½	8½	33/–	—	4 4 10
Urban Ordinary	1	7	7	33/9xd.	—	4 3 3
Westminster Ordinary	1	8½	8½	33/–	—	4 4 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 6
Yorkshire Elec.	1	8	8	39/–	–1/–	4 2 0

Home Rails.

Central London Ord. Assented	Stock	4	4	82½	—	4 17 0
Metropolitan	,,	3½	2½	60	—	4 3 4
Do. District	,,	5	4½	66½	+1	6 15 4
Underground Electric	1	8	7	19/–	–6d.	7 7 4

Telegraph and Telephones.

American Tel. & Tel.	$100	9	9	162½	–6	5 10 9
Anglo-Am. Tel. Pref.	Stock	6	6	105½	—	5 13 9
Do. Def.	,,	1½	1½	26	–½	5 15 5
Cables & Wireless 5½% Pref.	,,	5½	2¾	79½	–3	3 9 2
Do. A 7½% Ord.	,,	—	Nil	29½	–3	—
Do. B ord.	,,	—	Nil	13	–1	—
Globe Tel. and T. Ord.	10	8½	Nil	11½	–½	—
Do. do. Pref.	10	6	6	11¾	–½	5 2 2
Great Northern Tel.	10	20	20	28	—	7 2 10
Marconi-Marine	1	15	10	33/9	—	5 18 6
Oriental Telephone Ord.	1	12	12	2½	—	*4 1 8

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	—	—	5/–	—	—
Do. do. 2nd Pref.	5	—	—	2/6	—	—
Do. do. 5% Deb.	Stock	—	—	7	—	—
British Electric Traction Def. Ord.	,,	5	5	300	—	—
Do. do. Pref. Ord.	,,	8	8	135½	—	5 18 0
Brazil Traction	100	—	—	13	—	—
Brit. Columbia Elec. Rly. Pfd.	Stock	5	5	101½	–1	4 18 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	12/–	+9d.	—
London United Tram Deb.	Stock	4	4	67½	—	5 19 5
Mexico Trams, 5% Bonds	—	5	5	45	—	11 2 2
Mexican Light Common	100	Nil	Nil	12½	—	—
Do. 7% Pref.	100	7	7	15	–5	—
Do. 1st Bonds	—	5	5	69½	—	7 11 10
Victoria Falls Ord.	1	15	15	78/–	–9d.	3 17 0
Yorkshire (West Riding)	1	Nil	Nil	5/–	—	—

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/–	—	5 6 8
Babcock & Wilcox	1	14	14	37/6	—	—
British Aluminium Ord.	1	10	5	25/–	—	4 0 0
British Insulated Ord.	1	15	15	68/9	–1/3	4 7 0
Brush Ord.	Stock	5	Nil	35	—	—
Callender's	1	15	15	3 7/8 xd	–¼	4 14 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 6
Crompton Parkinson Ord.	5/–	30	24	21/3	—	5 13 0
Do. 8% Pref.	1	8	8	30/–	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/3	—	6 3 8
Do. 5% Deb.	Stock	5	5	100	—	5 0 0
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	4 7/8	–¼	5 12 7
English Electric	1	Nil	Nil	10/–	–9d.	—
Do. do. Pref.	1	Nil	Nil	14/–	+3d.	—
Ever Ready	5/–	35	35	29/–	—	6 0 8
Ferranti Pref.	1	7	7	23/6	—	5 19 2
G.E.C. Pref.	1	6½	6½	29/6	–6d.	4 8 2
Do. ord.	1	10	8	40/9	—	3 18 6
Henley's	1	30	30	6 7/8	–⅛	4 17 0
Do. 4½ Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/–	–1,9	—
Johnson & Phillips	1	10	5	1	—	5 0 0
Siemens Ord.	1	7½	7½	25/9	–9d.	5 6 6
Telegraph Construction	12	Nil	Nil	10½	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

9447. "Illuminated signs, imitation fires, and other apparatus embodying flicker producing means." J. R. Quain and H. Harrison. January 28th, 1932. (382674.)

11655 "Electrical picture and the like transmission systems." Dubilier Condenser Co. (1925), Ltd. (Radio Patents Co., Inc.). April 20th, 1931. (382617.)

20423. "Transforming electric currents." International General Electric Co., Inc. July 16th, 1930. (382612.)

21284. "Ship and other similar telegraphic apparatus." Chadburn's (Ship) Telegraph Co., Ltd., and A. C. Bamford. July 25th, 1931. (382631.)

21285. "Inductive loading coils for submarine electric signalling cables." Electrical Research Products, Inc. July 25th, 1930. (Addition to 342301.) (382614.)

21301. "Echo sounding and subaqueous signalling systems." Marconi Sounding Device Co., Ltd., and J. A. Slee. July 25th, 1931. (382615.)

21305. "Cover plate for the bearings of electrical machines." W. E. Evans. (Allgemeine Elektricitäts-Ges.) July 25th, 1931. (382616.)

21451. "High frequency transmitters and receivers suitable for use in radio signalling." Marconi's Wireless Telegraph Co., Ltd., and O. S. Puckle. July 27th, 1931. (382648.)

21523. "Electrical fusible cut-outs." G. L. Hill. July 28th, 1931. (382634.)

21530. "Manually operable selecting switches for use in intercommunication telephone systems. Associated Telephone & Telegraph Co. April 27th, 1931. (382635.)

21562. "Regulating devices for dynamo-electric machines." British Thomson-Houston Co., Ltd., and L. J. Davies. July 28th, 1931. (382636.)

21591. "Electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and G. F. Brett. July 28th, 1931. (382638.)

21596. "Electric conductors for railways." S. M. Rutnagur. March 21st, 1931. (382639.)

21704. "Electric circuit interrupters." G. A. Juhlin, A. C. Ehrenberg, and Associated Electrical Industries, Ltd. July 29th, 1931. (382655.)

21705. "Electric tap changing switches." H. Diggle, J. Fowler, and Associated Electrical Industries, Ltd. July 29th, 1931. (382656.)

21753. "Telephone recording systems." Standard Telephones & Cables, Ltd., S. S. Hill, and P. R. Thomas. July 30th, 1931. (382658.)

21754. "Automatic or semi-automatic telephone exchange systems." Standard Telephones & Cables, Ltd., E. P. G. Wright, and G. C. Hartley. July 30th, 1931. (382659.)

21778. "Control of electric motors." British Thomson-Houston Co., Ltd., and B. Adkins. July 30th, 1931. (382661.)

21782. "Insulated electric conductors." Automatic Electric Co., Ltd. August 14th, 1930. (382662.)

21806. "Electromagnetic light valves." Electrical Research Products, Inc. October 4th, 1930. (382663.)

21904. "Manufacture of electric conductors, and insulating compounds therefor." Electrical Research Products, Inc. August 11th, 1930. (382667.)

21905. "Electrodynamic devices for use in receiving or transmitting sound." Electrical Research Products, Inc. January 31st, 1931. (Addition to 333,578.) (382668.)

22402. "Automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. August 7th, 1931. (382679.)

22529. "Traffic operated road signal." G. White. August 10th, 1931. (382680.)

22606. "Electric wall switches." General Electric Co., Ltd., and J. H. Collins. August 10th, 1931. (Cognate application 29730/31.) (382681.)

22643. "Control switchgear for electric motors, and static condensers therefor." Lancashire Dynamo & Crypto, Ltd., and J. W. Howard. August 11th, 1931. (382682.)

23409. "Electric fuse holders." General Electric Co., Ltd., and F. G. Quance. August 19th, 1931. (382686.)

23808. "Means for initiating and maintaining high-tension currents in gas purifying apparatus." Siemens-Schuckertwerke Akt.-Ges. August 23rd, 1930. (Addition to 2209/31.) (382692.)

23937. "Production of zinc containers for dry batteries." J. S. M. Nurnberg. June 18th, 1931. (382694.)

24046. "Apparatus for protecting polyphase alternating-current electrical apparatus, and particularly polyphase electric motors." Electrical Apparatus Co., Ltd., C. M. Jarvis, and R. H. Barbour. August 26th, 1931. (382695.)

24527. "Electrical oil switch fuses." R. T. Norton. September 1st, 1931. (382701.)

24894. "Arc welding." British Thomson-Houston Co., Ltd. September 4th, 1930. (382702.)

25855. "Electric induction furnaces." Electrical Furnace Co., Ltd. September 24th, 1930. (382708.)

26339. "Electric motors." Servel Inc. September 20th, 1930. (382713.)

26649. "Handle-carrying devices or appliances for electric storage batteries and the like." F. Temple. September 24th, 1931. (382716.)

26770. "Brush gear for electric motors." Watliff Co., Ltd., and W. E. Woodhead. September 25th, 1931. (382717.)

27759. "Electrical contactors." Allen West & Co., R. M. Malloch, and W. J. Paddock. October 6th, 1931. (382728.)

28579. "Circuit breakers for high-tension electric transmission lines." J. G. Statter & Co., J. G. Statter, and G. S. Marston. October 14th, 1931. (382732.)

29237. "Electric motors for elevator door apparatus." A. A. Thornton (Peelle Co.). October 21st, 1931. (382740.)

29323. "Electric discharge devices." M-O Valve Co., Ltd., C. G. Eden, and C. J. Smithells. October 22nd, 1931. (382742.)

30123. "Electric immersion heaters." H. H. Berry and C. A. Painton. October 30th, 1931. (382751.)

31291. "Cable connectors." Siemens & Halske Akt.-Ges. August 8th, 1931. (Addition to 31290/31.) (382762.)

32882. "Safety lock for electric lamp bulbs." D. McGilp. November 27th, 1931. (382780.)

33192. "Incandescent electric lamps." B. Arakawa. November 29th, 1930. (382786.)

34288. "Electric connections." British Thomson-Houston Co., Ltd. December 11th, 1930. (382795.)

34734. "Coin and clockwork controlled electric switches." C. Lange. December 15th, 1931. (382799.)

35127. "Brake systems for electrically propelled rail vehicles." A. W. Maley and E. M. Taunton. December 18th, 1931. (382802.)

1932

596. "Electric disturbance filters." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 30th, 1931. (382809.)

914. "Device for simultaneous regulation and rectification of electric current." Allmanna Svenska Elektriska Aktiebolaget. January 12th, 1931. (382810.)

3127. "High-tension cut-outs." International General Electric Co., Inc. February 4th, 1931. (382825.)

3399. "Mercury switches." Allgemeine Elektricitäts-Ges. March 6th, 1931. (382826.)

3927. "Multipolar overload circuit breaker." Voigt & Haeffner Akt.-Ges. February 14th, 1931. (382827.)

8464. "Electric radiators." N. A. Lamb. March 22nd, 1932. (382866.)

9512. "Sound amplifying apparatus." S. J. Murdoch. April 2nd, 1932. (382868.)

9996. "Quick make and break electric tumbler switch." A. F. Bulgin and H. T. Stott. April 7th, 1932. (382870.)

10553. "Electrical motors." R. Bosch Akt.-Ges. April 20th, 1931. (382874.)

11080. "Systems of electrical distribution." British Thomson-Houston Co., Ltd. April 17th, 1931. (382876.)

11877. "Super-regenerative receivers." Marconi's Wireless Telegraph Co., Ltd. April 24th, 1931. (382881.)

12607. "Electrolytic condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 2nd, 1931. (382886.)

13446/7. "Electrical fuses." N. Maguire and N. Stone. May 10th, 1932. (382893/4.)

15076. "Electromagnetic friction clutches." F. Seeberger. May 27th, 1932. (382905.)

16190. "Thermionic amplifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 16th, 1931. (382915.)

16591. "Electrolytic condensers and rectifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 20th, 1931. (382916.)

16906. "Portable electric lamps, more particularly auxiliary lamps for vehicles." C. Kaiser. July 11th, 1931. (382919.)

19692. "Suspension frame for enclosed or hooded electric miners' lamps." Concordia Electrizitäts Akt.-Ges. August 22nd, 1931. (382927.)

20818. "Cut-outs for incandescent electric lamps." British Thomson-Houston Co., Ltd. July 23rd, 1931. (382931.)

21702. "Mercury-vapour rectifiers." Akt.-Ges. Brown, Boveri, Et Cie. July 30th, 1931. (382932.)

22839. "Devices for determining the phase of an alternating voltage." International General Electric Co., Inc. August 14th, 1931. (382933.)

23179. "Lighting devices." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 20th, 1931. (Addition to 376668.) (382934.)

26031. "Television apparatus." British Thomson-Houston Co., Ltd. September 19th, 1931. (382939.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 16th:—

Maestrophone. No. 516943. Class 8. Radio gramophones, etc.—Société E. Paillard & Cie., St. Croix, Switzerland. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

National (lettering and design). No. 521514. Class 8. Telephonic instruments, switchboards and other electrical appliances.—National Cash Register Co., Baltimore, Md., U.S.A. (British representatives: Herbert Haddon & Co., 31-32, Bedford Street, Strand, W.C.2.)

Azyp. No. 533967. Class 8. Electrically illuminated advertising and like signs.—A. Zentler, 4, Briar Road, Kenton.

Berec. No. 534117. Class 8. Electric dry batteries, cells, and accumulators (none being for medical purposes).—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N.7.

Sinterac. No. 535200. Class 8. Automatic electrical advertising apparatus for use in illuminating articles for display purposes in rotation.—L. G. Topliss, trading as L. G. Topliss & Co., 7, Princes Street, Westminster, S.W.1.

Setalite. No. 535468. Class 8. Electrically illuminated advertising and the like signs.—Setalite, Ltd., Regent House, Kingsway, W.C.2.

Rosoman. No. 535457. Class 11. Electrical contrivances for sterilising surgical and dental instruments.—White Electrical Instrument Co., Ltd., Rosoman Street, Rosebery Avenue, E.C.1.

Deoto. No. 532027. Class 13. Electric light bulbs for use in motor-car head, side, and tail lamps.—S. Sassoon & Co., Ltd., 65, Houndsditch, E.C.3.

Nippy. No. 525344. Class 13. Electric cooking, toasting, and heating stoves.—Berkeley & Young, Ltd., Rushey Lane, Tyseley, Birmingham.

Philalurex (lettering and design). No. 533516. Class 14. Electric kettles, coffee pots, &c.—Albert Phillips, Ltd., Eyre Street, Spring Hill, Birmingham.

Nova-Lux. No. 534677. Class 15. Glass reflectors for electric lighting.—G. H. Lunge, 29, Ludgate Hill, E.C.4.

Colbox. No. 535158. Class 50. Electrical insulating materials made of bitumen, petroleum jelly, waxes, resins, mica, asbestos, and vegetable fibre, or of compounds of these substances.—Blackall Bros., Ltd., 1-3, Short Road, Stratford Market, E.15.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alton (HANTS).—Houses (30); Milton & Son, builders, Witley.

Auchinleck.—Houses (26), with electrical work, for C.C.; W. Reid, architect, 14, Wellington Square, Ayr.

Audenshaw (MANCHESTER).—Houses (22), Sidmouth Street; A. J. Franks.

Barnehurst (KENT).—Library, Mayplace Road (£2,500), for C.C.

Blackwell.—Houses (26); H. T. Sudbury, architect, Rutland Chambers, Ilkeston.

Blaydon-on-Tyne.—Houses (56); T. Mastaglio, U.D.C. surveyor, Council Offices.

Bonnyton.—Racing track for the Ayrshire Greyhound Racing Co., Ltd.

Bridgwater.—Cattle market extension (£10,547); borough engineer.

Brierley Hill.—Houses (40), Hawbush Road Estate; U.D.C. surveyor.

Broadstairs.—Pavilion (£4,000); G. Browning, builder, Canterbury.

Burntisland.—Houses (36), Rossend; J. A. Waddell, burgh surveyor.

Chartham (KENT).—Extensions to Mental Hospital (£30,000); W. H. Robinson, county architect.

Colchester.—Extensions to nurses' home, Poor Law Institution (£3,325); W. B. Kingsbury, Chelmsford.

Dover.—Additions, Royal Victoria Hospital; F. G. Hayward, architect, Market Square.

Dudley.—Technical college; J. Whaley, director of education.

Durham.—School, Burnhope, and extensions to Delves Lane School for the County E.C.; F. Willey, 34, Old Elvet, Durham.

Ealing.—Development of Perivale Park Estate; R. Lancaster & Sons, 30, Ealing Road, Wembley. Development of Popes Lane Estate; J. Atherton & Co., 134, East Acton Lane, W.3. Development of Stanhope Estate; R. A. C. Churchward, architect, 12, Victoria Street, S.W.1.

Egham.—Houses (176), Pooley Green Road and West End Housing Estate; U.D.C. surveyor.

Elemore Colliery (Co. DURHAM).—Pithead baths (£25,000); A. H. Earnshaw, builders, Darlington.

Eltham.—Extensions to the College; governors.

Essex.—Senior schools, Panfield Lane, Braintree; Sawyers Hall Lane, Brentwood; and Pettits Lane, Romford (£34,000); county architect, Chelmsford.

Farnborough (HANTS).—Houses (28), Tower Hill; Shaw's Building & Public Works Construction Co., Ltd., builders.

Great Yarmouth.—Houses (126), Middleton Road site; borough engineer. Alterations, Royal Aquarium; Olley & Haward.

Greenford (MIDDLESEX).—Development of Greenford Hall Estate; Greenford Estates, Ltd., Costons Lane.

Hebburn-on-Tyne.—Extensions to U.D.C. offices, Argyle Street; T. A. Page & Son, architects, 67, King Street, South Shields.

Hednesford.—Houses (86), Prairie Farm; A. J. Fieldhouse.

Hertfordshire.—School, Harpenden (£20,000); director of education, Hertford.

Hildenborough (KENT).—Land development, Main Road; Foxbush Estate.

Hornchurch (ESSEX).—Extensions to Poor Law Institution (£325,000); county architect, Chelmsford.

Huddersfield.—R.C. Church; Rev. J. Gragan, rector of St. Patrick's Church, 34, New North Road.

Hyde.—Extension to Borough Hospital; borough surveyor.

Irish Free State.—(BALBRIGGAN, Co. DUBLIN).—National school; J. J. Robinson, architect, 8, Merrion Square N., Dublin. (SLIGO).—Alterations to Mental Hospital; clerk to C.C. (TULLAMORE, KING'S COUNTY).—Houses (57); T. S. Duggan, surveyor, Courthouse.

Kent.—Schools, Bexley, Dover, and Minster; also workshops for technical college, Dartford; County E.C.

Lancing (SUSSEX).—Cinema, Penhill Road; I. Morris, Coliseum, Shoreham-by-Sea. Post Office, South Street; H.M. Office of Works, King Charles Street, S.W.1.

Leeds.—Houses, Ivy House Estate; East End Park; W. Jowitt. Houses, Torres Estate; J. C. Acfield, city engineer. Library and extensions to Girls' High School, Headingley; secretary. Shops, Shaftesbury House Estate, Street Lane; S. Webb. Schools, Torre Road, for the manager of St. Patrick's schools (electric lighting installation); Empsall Clarkson & Clarke, architects, Permanent Chambers, Piece Hall Yard, Bradford.

Little Hulton.—Houses (54), Hilton Lane; U.D.C. surveyor.

London.—(LEYTON).—Swimming bath, High School for Girls; governors. (ST. JOHN'S WOOD).—Flats, Abbey Road; Sir Aston Webb & Son.

Lowestoft.—Extensions, 82-4, London Road; Marks & Spencer, Ltd.

Luton.—Bazaar stores, George Street; F. W. Woolworth & Co., Ltd.

Manchester.—Church of All Souls, Weaste Lane and Liverpool Road; W. Ellis, architect, 49, Deansgate. Shops, Sharston; city architect, Town Hall. Junior Boys' Municipal School, Green End Burrage (electric lighting installation); Smith & Briggs, builders, Chester Road, Old Trafford.

Middlesbrough.—Extensions to premises for the Northern Poultry Foods, Co., Marsh Road; Kitching & Co., architects, 21, Albert Road.

Minehead (SOMERSET).—Cinema, dance hall, and shops (£40,000), for Minehead Entertainments, Ltd.; R. Totty, managing director, Queen's Hall.

Motherwell.—Houses (164), Mill Road; burgh surveyor.

Nelson.—Houses (23); borough surveyor.

Newcastle-on-Tyne.—Houses (42), Debden Gardens and other sites; Storey & Reid, builders, 5, Glendale Avenue, Monkseaton. Houses (36), Kingsway and Fowburn Gardens; Kirk & Dickinson, builders, New Bridge Street. Houses (128), Serogg Road, Walker; W. C. Leech, builder, Courts Road. Cinema (1,200 seats), West Road; F. M. Dryden, architect, 6, Market Street. Four-storey P.O. sorting office; H.M. Office of Works, King Charles Street, S.W.1.

Northallerton.—Extensions to Poor Law Institution; D. Oakley, Ltd., builders, Romanby Road.

North Riding.—Senior school, Eston (£15,000); director of education, Northallerton.

Olton (WARWICKSHIRE).—Cinema; Cinema Co.

Otford (KENT).—Estate development, Pilgrims Way; W. B. Collier, Pilgrims Road.

Penwortham (NR. PRESTON).—R.C. church; Rev. J. McNally, St. Mary Magdalene Church.

Penzance.—Houses (156), for the T.C.; borough surveyor.

Portsmouth.—Relief schemes (£300,000); city engineer.

Preston.—Junior school, Greenlands Estate; borough engineer.

Prestwich.—Extension to the County Mental Hospital; clerk to the Board of Visitors.

Ryton-on-Tyne.—Houses (25), Stargate, Crawcrook, and Greenside; Newcombe & Newcombe, architects, Eldon Square, Newcastle.

Sale.—Houses (44), Septon Crescent; E. Bleakley, U.D.C. surveyor, Town Hall.

Scarborough.—Houses (32); R.D.C. surveyor.

Sheffield.—Works, Porter Street, for the Sheffield Cabinet Co., Ltd. (£30,000).

South Moor (DURHAM).—Methodist church (£1,500); T. Soulsby, builder, Garden House, Pelton.

Southport.—Greyhound racing track, Blowick; W. C. Ralph & Son, architects, Leader's Buildings, 31a, King Street, Wigan.

South Shields.—Houses (366), Cleadon Estate, for the Sutton Dwellings Trust; C. S. Errington, architect, Victoria Buildings, Grainger Street West, Newcastle-on-Tyne.

Stafford.—Houses (80), Walton Estate; G. E. Plant.

Stockton-on-Tees.—Re-erection of Hippodrome Theatre, electrically equipped (£40,000); H. Metcalfe, manager.

Stourport.—Houses (80), Tan Lane; L. H. Poole, U.D.C. surveyor.

Sunbury-on-Thames.—Houses (24); H. F. Coales, U.D.C. surveyor.

Sunderland.—Houses (100) (£20,000); H. Bell (Ryhope), Ltd., builders, Ryhope. Houses (22), Carley Road Estate, Southwick; borough engineer, Town Hall. Coach-building works; H. H. Farrow, builder, 17, Burnville Road.

Swanscombe (KENT).—Engine house; Kent Craft Mills Co., Ltd. Fire station and library extensions; U.D.C. surveyor. Alterations and additions, Craylands Lane; Shell-Mex & B.P., Ltd.

Taunton.—Automatic telephone exchange; H.M. Office of Works, King Charles Street, S.W.1.

Warwickshire.—Nurses' home, County Mental Hospital (18,000), and school, Sharman's Cross; county architect, Shire Hall, Warwick.

Wealdstone (MIDDLESEX).—Electric vehicle power house, Kenton Road; Express Dairy Co., Ltd.

West Kirby.—Extension to St. Agnes's R.C. Church; Rev. Canon Marrs, Darmond's Green.

West Malling (KENT).—Pavilions, boiler house, &c., at the Colony for Mentally Defectives, Leybourne Grange; W. H. Robinson, architect, Springfield, Maidstone.

West Wickham.—Shop site development, Station Road; G. E. Spencer.

Wheatley Hill (DURHAM).—Alterations to Co-operative Wholesale Society premises; C.W.S., architects' department, 90, Westmorland Road, Newcastle.

Whitehaven.—Houses (120), Woodhouse site; borough engineer.

Worcestershire.—Infirmary extensions, Evesham (£10,000), for the P.A.C.; Espley & Co., Ltd., builders.

York.—Baths (£40,000); city engineer.

Domestic Electric Appliances in France

The French Syndicat du Chauffage Electrique et des Appareils Electro-Domestiques has recently issued statistics showing the progress that is being made in France with the use of electrical household appliances. Last year the manufacturers associated with the Syndicat sold 1,297,437 appliances with a total capacity of 546,958 kW, valued at 86,466,000 francs, or over a million sterling at the current rate of exchange. Adding the sales of the firms not connected with the Syndicat, *Le Journal des Electriciens* estimates that the total sales amounted to 1,350,000 appliances of a value of 100 million francs and a total capacity of about 600,000 kW.

Taking the average use of the apparatus sold in one year as 500 hours per annum (less than 1½ hours per day) this represents a consumption of 300 million kWh per annum. Irons are the most popular appliances, 801,000 (258,000 kW) having been sold last year. Next on the list are portable radiators, these totalling 132,000 (86,300 kW), followed by 90,000 boiling plates (37,100 kW), 83,300 fires of 600 kW and over (65,000 kW), 46,500 radiators (16,500 kW), 43,000 small cookers and heaters (16,500 kW), 26,200 fans (1,300 kW), 21,000 hair dryers (9,700 kW), and 20,000 vacuum cleaners (27,000 kW).